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Multum in Parvo: the Aegean Island of Sikinos*

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At the beginning of the sixth century B.C. the Athenian lawgiver Solon remarked that he would rather be a citizen of Sikinos than fail in his duty toward Athens, thus establishing that island once and for all as a symbol of a nonentity. The reason is not hard to find. It is one of the smallest (14½ square miles) and most barren of the group of islands southeast of the Greek mainland known as the Southern Cyclades. Sikinos itself lies between Ios and Pholegandros, northwest of Santorini, and commands a view, clockwise, of Pholegandros, Melos, Kimolos, Siphnos, Paros, Naxos and Santorini. Its one harbor is hardly more than a shallow indentation in the south side of the island where it receives the full force of the winds that drive across the Cretan Sea, sometimes making the island completely inaccessible.

After Solon's disparagement it is not surprising to find few references to its history. It is mentioned in 425 B.C. in a list of states paying tribute to Athens as having made a first payment of 1000 drachmas, probably the smallest recorded assessment, and in an inscription of 378 B.C. its name appears in a list of states joining the Athenian Alliance. After that it virtually drops out of sight, as far as written records go, except for stray bits of geographical information which can be summed up in a few words: the roughness of its mountains, the inadequacy of its harbors and the splendiddness of its figs. Mention is also made that Sikinos was once called Oinoe on account of the excellence

of its wine. In fact one of its coins bears a bunch of grapes as its symbol. But the vineyards are now sparse and anyone who has sampled the wine will agree that this phase is best forgotten.

Oblivion had one advantage, however, in the preservation of a little temple-like structure, 1000 feet above the sea and virtually unknown to modern travelers (Fig. 1). It was first noticed, probably in 1771, by a Dutch sailor, Count Pasch von Krienen, who was quite bowled over by what he termed "its ancient magnificence," and he was ready to believe wholeheartedly the assurance of the bishop of Siphnos that it was built 700 years before Christ. Other travelers both before and after von Krienen visited Sikinos or were prevented by the wind from doing so, but none mentioned this building until 1837, when it was visited and described by the German scholar, Ludwig Ross, Chief Inspector of Antiquities for King Otto, immediately after the liberation of Greece from the Turks. It was he who christened it in the Temple of Apollo Pythius with a date in the third or second century B.C., and published a drawing of it (Fig. 2).¹ But it never became a popular objective and so his identification and date were generally accepted. The original building is now dominated but not obscured by additions and changes made in the seventeenth century as we see it now, as a church, dedicated to the Dormition of the Virgin and known locally as Episkopi.

The temple (to retain Ross's term until it is shown to be something else) is a rarity on two counts: it is one of the best preserved buildings of the classical period in Greece

* Read before the American Philosophical Society, 24 April 1982.

and the only one, so far as I know, that has been allowed to retain all its later accretions, and so the record of its history. This happy chance is due to its location on a remote island where it escaped the zeal of the classically-oriented archaeologists of the nineteenth century for whom history ended with Alexander the Great and who, in stripping down all ancient monuments to what was left of the original structure, assiduously removed all traces of their subsequent history. On Sikinos, furthermore, since there is no wheeled traffic on the island, there can have been little temptation or opportunity to carry away the ancient blocks for use as building material elsewhere.

Probably few would deplore all of this scholarly activity, and that we can see the Parthenon (or at least could until recently) freed of the clutter, however picturesque, that accumulated over the centuries. By that time, in any case, the Venetian bombardment of the Turkish garrison on the Acropolis in 1687 had destroyed, along with much of the original structure, all of its later additions, including the minaret that was erected when the Christian phase of the Parthenon gave way to the Moslem.

It might seem that what happened to the Parthenon and other ancient buildings, whether in Athens or on Sikinos, after they had outlived their original purpose, would be of purely academic interest, since it is common knowledge that most pagan temples, if they were not destroyed, were turned into churches. But it is becoming increasingly clear that the transition from paganism to Christianity was not equally easy in all parts of the Roman Empire, and that some areas lagged far behind others. And so the architectural evidence for the date of conversion of the actual buildings assumes some importance in the study of that conflict.

With that problem in mind (and led on by Ross's drawing), I visited Sikinos for a couple of days in 1966. What I saw raised some doubts about the accepted date and identification of the so-called temple. Since

it had never been adequately published, permission was obtained from the Greek Archaeological Service for a more thorough investigation, and this was carried out the following year by Homer Thompson, Field Director of the Agora Excavations in Athens, John Travlos, architect of the American School of Classical Studies in Athens, and myself, with the help of a generous grant from the American Philosophical Society.²

The dominant factor in the life of the Cyclades in the Middle Ages was fear of pirates, chiefly Arabs, who controlled the Aegean after capturing Crete in the ninth century. Most of the smaller islands were deserted, or nearly so, for long periods. What few towns there were were placed high in the comparative safety of the hills, with a minimum of shore installations, a tradition that has survived down to modern times. So it is with Sikinos. The only town is reached by the winding Turkish mule road from the harbor in 45 minutes. This houses all the 300-400 inhabitants of the island. Lodgings are obviously primitive, with no such amenities as running water, but they are not without charm. The town is an hour and a quarter from the temple and it was from here that we made our way every day to the site.

The temple stands isolated on the ridge of the mountain that forms the island and can be recognized in the white spot in the distance as it first comes into view half way from the village (Fig. 3). To the left, a steep, rough path leads down through a cleft in the mountain to a little rocky beach where a small boat might land in favorable weather, and an equally precipitous cliff looks over the sea on the north side.

The building is small, about 20 × 30 feet, and, contrary to the usual practice for temples, faces west. Originally it resembled, superficially at least, any conventional temple of its type, that is, a simple building with an open, two-columned porch leading through a large doorway into the main room, or cella (Fig. 4a). But there was an important difference between this building

and its stereotype, detected only when we removed plaster from the inner face of the cella wall and discovered the spring of a vault, showing that from the beginning the cella had a barrel-vaulted roof. From the absence of any roof-tiles roundabout it appeared that the curve of the vault on the outside was exposed, as in a modern church nearby. The ceiling of the porch, on the other hand, was horizontal, consisting of marble slabs carried on marble beams. The columns of the porch are Doric, slender for that order, unfluted, and rest on Ionic bases (Fig. 5). The large doorway leading into the cella is framed with marble slabs, blue for the threshold and jambs, white for the cornice and lintel (Fig. 6). (The diagonal braces and the masonry above are much later repairs, necessitated by breaks in the lintel). At the top of the right-hand jamb is an inscription, to which we will return.

Underneath the cella is a crypt consisting of two vaulted chambers, entered separately through the south foundations (Fig. 7). The crypt had been dismissed as a much later addition in the few references to it but a closer look showed it to be part of the original structure. It was the desire to have a crypt, in all probability, that determined the choice of the site, since the steep slope on the south side permitted construction with a minimum of quarrying and facilitated entrance through the exposed foundations (Fig. 17). The choice proved disastrous, as we shall see, but long after the building had outlived its original function.

The discovery that from the beginning the building had a vaulted roof and possessed a crypt showed that the third-century date and the identification as a temple of Apollo must be reviewed carefully. Ross's conclusions were based on an inscription found built into one of the late walls nearby, of which only the lower part now remains. It is a decree honoring a citizen of Paros and ends with the stipulation that it be set up in the sanctuary of the Pythian Apollo. On the basis of the letter forms Ross dated the inscription to the late third or early second

century B.C. and, assuming that it was near its place of origin and that ours was the sanctuary referred to, he named and dated it accordingly.

But the vaulted cella, the slim Doric columns on Ionic bases and the massive, bulging profile of the molding under the cornice (Fig. 8) all combined to point to a date in the late second or early third century after Christ, that is, four or five centuries later than the inscription. It is thus impossible to associate the inscription with the building and so the connection with Apollo is lost. The inscription is only about a foot wide, so it was quite portable and could easily have made its way down from the ancient town on the peak above. There were compensations for the loss of the attractive picture of a temple of Apollo for we were now able to make use of some bits and pieces of evidence that had previously been rejected as too late to be relevant and, in fact, to trace the history of the building from the late classical period to the relatively modern and, most important, to introduce a hitherto unsuspected intermediate phase, the Early Christian.

For the first of these periods, the late classical, the presence of the crypt takes on special importance. It would have no reason to exist in a temple but every reason in a monumental tomb, a type of building common in the Greek world in the second and third centuries of our era. Although differing in detail, they have the same basic elements: the vaulted tomb chamber above and the crypt below, entered through the foundations. In such tombs the main chamber was reserved for the immediate family; slaves and freedmen were relegated to the crypt, as specified in more than one inscription.³ So now the westward orientation, which would require some explanation in a temple, ceases to be troublesome.

To return to the inscription in the doorway, which had been brushed aside as a late addition (Fig. 9), it honors a woman whose name was obliterated by the late repairs but whose ineffable beauty, wisdom and virtue

are extolled in an epigram of which the florid style as well as the letter forms are characteristic of the late second or third century A.D. A half statue (the bottom is finished, not broken) lying in the field near the tomb is a reminder that Ross reported seeing two draped portraits, one male, the other female. There can be little doubt that they represented the couple for whom the tomb was built and here therefore is the husband of the lady of the epigram (Fig. 10).

We know too little about the ancient tomb up the hill to have any clear idea of what sort of people lived and died there, and who were of sufficient consequence to have tombs erected on this scale. The unchanging features of the sea, mountains and rocks leave little reason to suppose that the later history of the island belied Solon's gloomy judgment, so the monument seems out of place.

But there was one field in which the islands were preeminent, and the smaller and more barren the better; that is, as a place of exile under imperial Rome. Seriphos and Gyáros are the islands appearing most frequently in the accounts of Tacitus and Juvenal; Naxos, Donousa, Kythnos and Amorgos are also mentioned, and all are in the Southern Cyclades. Any others in the group might have served equally well and Tacitus' reference to a "mass exodus" under Nero and other allusions to "one of the Cyclades" or "some rock in the Aegean" imply that far more than those actually named were involved.⁴ Since the only requirement seems to have been a maximum of rock and a minimum of comfort Sikinos would surely qualify. It might be added that this practice was imitated in the recent dictatorship in Greece—and to the same islands. I would like to suggest therefore that our monument might have been built for one of these exiles and his wife, or their descendants, who perhaps preferred the simple security of Sikinos to a luxurious but dangerous life in Rome.

There is another possibility, that this is the tomb of a native of Sikinos who made a fortune in commerce by sea, like a mer-

chant in Phrygia who, according to the sepulchral inscription, after making 72 voyages to Italy built a tomb for himself and his children and anyone else who might wish to share it. But even allowing for 95 percent hyperbole in the epitaph of his wife it is hard to reconcile a lady with "the figure of Hera and the wisdom of Athena, who had been called by the gods to share eternal life with the famous women of the past" with the wife of a self-made shipping tycoon on Sikinos, unless life on the island was on a far higher plane than we feel there is any reason to suppose. So let us leave the more interesting option open, at least a crack.

To turn to the building as a Christian church—on my first visit to Sikinos a tantalizing glimpse through a crack in the nailed-up door of the wooden altar screen (Fig. 11) showed on the support for the altar table some Early Christian carving, only dimly discernible under a heavy coat of whitewash (Fig. 12. a, b). (It was this that sent me back to Sikinos). No trace of an early church could be found nearby so it seemed probable that the tomb itself had served as a church long before the seventeenth century. The conversion of temples into churches normally entailed two basic changes: reversal of orientation with the entrance at the west instead of the east, and the construction of an apse at the east end. As we have seen, our monument was already oriented properly for Christian use, so we had only to look for a predecessor to the present apse, which is far too small to be so early and also structurally impossible. Careful examination around the east end eliminated the possibility of anything earlier but some encouraging evidence was provided by the interior, for when we removed the plaster on the wall of the present apse two more carved pieces came to light (Figs. 12. c; 13). They were damaged, but carefully set into conspicuous places, as if for revered relics, one at the corner, the other in the center, directly under the window (Fig. 14). The three are closely related: two posts and

a closure slab from what must have been an original altar screen, or templon, to distinguish the low, Early Christian form from the all-concealing later screen. All the elements of the design belong to the repertory of Early Christian ornament, but the flat carving, without inner detail, in the closure slab brings the whole group down to its very latest phase—hardly earlier than the seventh century or later than the eighth, and this corresponds with the little that we know from literary sources about the Christianization of the islands and adds a welcome piece of evidence in what is still a relatively uncharted field.

The tomb must have been virtually intact at that time. The only structural changes were minor because the building was already oriented properly for Christian use (Fig. 4. b). Two small doorways were created flanking the main entrance, according to Christian practice (they were later blocked up for practical reasons but their outlines can be distinguished under the whitewash). At the same time the central doorway was fitted with a solid door, so that the tomb chamber became the main body of the new church, leaving the porch as the narthex. But the outward appearance of the building was unchanged from its original form, recalling a reference by Procopius in the sixth century to the transformation of two temples in Asia Minor "without changing them in any way," as if this were something exceptional.⁵

The church had been standing this way, almost undamaged, for about 1000 years when it met with a sudden and violent disaster, almost certainly an earthquake, which caused it to split down the middle. The vaulted roof collapsed as the poorly supported south wall gave way and opened outward to a dangerous degree, without actually falling but causing severe damage to the east wall and generally weakening the fabric.

The precarious state of the building demanded immediate and extensive repairs and it was only now that it took on its present appearance (Fig. 5). The west facade was solidified by filling the intercolumnar spaces

with masonry, with a small door in the middle. The south wall was reinforced by heavy buttresses composed largely of material from ruined parts of the roof and cornice, and the vault was replaced by a low 12-sided dome carried on pointed arches (Figs. 11, 15). The east wall was rebuilt, with the addition of a small apse (Fig. 16), and the salvageable pieces of the templon, which must have received their damage from the falling roof, were rescued and given a place of honor (Fig. 14).

Given the limitations imposed by the original building, the church has much in common with those of the neighboring islands, with its small apse, low dome and belfry. A broad framework for the date of all of them is provided by the island of Paros, where out of nearly 100 churches, some 80 have founders' inscriptions with dates, the great majority in the seventeenth century, with a few each in the sixteenth and eighteenth.⁶

But for the church on Sikinos we can be more precise within these limits. The occasion for this elaborate reconstruction was undoubtedly the creation of the Archbishopric of Siphnos in 1646, a new diocese comprising a number of the Cyclades, including Sikinos. This would account for its common name, *Episkopi*.

At this point the final phase of the history of the building is illuminated by some disension in the Greek Church, in which the church on Sikinos became a political football and so reached the attention of the Patriarch himself, Kallinikos II (1688-1702). As a result, the Patriarch felt obliged to issue a Bull reiterating the claim of the priest Damisinis to "a church on the island of Sikinos in the name of the All-Holy Mother of God, the Theotokos, and called *Episkopi*." The title, the document continues, was originally granted by the first archbishop of Siphnos, Athanasios (1646-1673), to Damisinis who, with his uncle and grandfather, had restored the church and might therefore be relied on to keep it in good repair. The title extended to all his heirs in perpetuity.

Since only Damisinis, the junior partner, is mentioned in the original grant we may assume that some time had elapsed since the reconstruction and that the uncle and grandfather were no longer living. The grant was renewed by a subsequent archbishop, Philaretos (1681–1685). But during the church quarrel Philaretos was unseated. Damisinis also lost his post temporarily and the church became impoverished and untended. Throughout the patriarchal document Kallinikos makes it clear that his chief concern is for the maintenance of the church, and he reiterates the reason for the first grant: the close ties of the family with the church. Finally he adds that the title will stand whether or not the church remains in its present status or becomes a monastery, as had been proposed.⁷

Advantage was taken of this provision and a small monastery complex was erected adjacent to the church on the north side. A little free-standing chapel was built alongside the church and next to it the monastery proper, consisting of a bakery, refectory and a series of cells (Figs. 17, 18). At this same time a parapet was built around the roof of the church to provide a lookout place against pirates (Fig. 1). Access was through an opening in the ceiling of the narthex where one of the marble slabs had been removed. For security the stairway leading up to the roof was completed only half way, the remaining span to be covered by a wooden ladder, to be pulled up by the last man (Fig. 19). A ladder in the corner of the narthex looks as though it might date from that time. The belfry, which is not symmetrical with

the facade of the church, was probably also added at this time.

The belfry may serve as an epilogue to the long history of the building (Fig. 20). This is not the place to go into the vicissitudes of the islands as the Venetians and Turks struggled for domination in the eastern Mediterranean except to call to mind that most of the Aegean islands had fallen to Venice after the Fourth Crusade in 1204. Sikinos was included in the Duchy of Naxos which the Venetians founded soon after, and although the Turks gained possession of all the islands in 1566, the one remaining bell of the three that hung in the belfry shows that Venetian influence was lasting. It is a splendid work, decorated with four scenes traditional for bells: two standing bishops, the Virgin and Child and the Crucifixion. Below the Crucifixion is the signature of the makers: "the work of the heirs of De Polis" (OPVS AEREDVM DE POLIS (Fig. 21). This was a famous Venetian family of bell-casters active from at least 1661 through a good part of the eighteenth century.⁸ Twenty seven of their bells are known in the region of the Adriatic, but none nearly so far afield as Sikinos. The signatures of the individual family members begin to give way to the collective "heirs" early in the eighteenth century, and it is to this time that we may assign the erection of the belfry, the final phase of the reconditioning of the church, with the installation of a trio of bells from this illustrious foundry quite literally the crowning feature of the whole undertaking.

NOTES

1. L. Ross, *Inselreisen*, ed. F. Hiller von Gaertringen, G. Karo, O. Kern, C. Robert (Halle, 1912), 1: 129–132.
2. A detailed account of the investigation, with references, was published by the three participants in *American Journal of Archaeology* 73 (1969): 397–422 (hereafter *AJA*).
3. Cf. *AJA*, 414, n.74.
4. For specific references cf. *AJA*, 397, n.7.

5. Procopius, *Wars*, 1.17, 18.
6. A. Orlandos, *Archaeion tōn Mnemeiōn tēs Hellados*, 1961, 197–221.
7. The complete text of the document, with commentary on the individuals involved, was published by Z. Gavalas, *Epeteris Hetaireias Byzantinōn Spoudōn* 7 (1930): 335–340.
8. A. Gnirs, *Alte und neue Kirchenglocken*, (Vienna, 1917), *passim*.



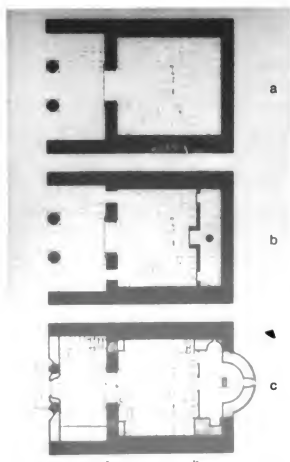
1. Sikinos. Episkopi from the northwest.



2. Episkopi, drawing by Th. Hansen after sketch by C. Ritter, 1837 (Ross, *Inselreisen* 1, facing p. 129)



3. Sikinos, southwest end of island. Arrow points to Episkopi.



4. Three periods of building: *a*. Original tomb. *b*. Early Christian church. *c*. Church in the seventeenth century.



5. West facade of the church



6. Doorway to cella



7. End of crypt chamber with doorway to passage



8. Northwest corner of entablature



9. Sepulchral epigram in doorway



10. Half statue from tomb



11. Seventeenth-century altar screen

12. Posts of Early Christian templon. *a*, *b*. Under altar table. *c*. In apse.



13. Closure slab of Early Christian temple



14. Early Christian marbles in apse



15. Seventeenth century dome and arches



16 The church from the northeast



17. Church and monastic complex



18. Monastery, bakery and kitchen



19. Late stairway to roof



20. Belfry



21. Bell, Crucifixion and signature

Biological Roots of Violence*

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The rising tide of human destructiveness which has done so much to impair the quality of life in recent years, coupled with the threat of nuclear extinction, has triggered a great deal of research and an avalanche of literature on the origins and control of aggression. Biological investigation has been particularly productive, though its acceptance has been impeded to some extent by two philosophical relics of the past.

The first impediment is the doctrine, derived from Mencius in the second century B.C. and later emphasized by Jean Jaques Rousseau, that men are born noble but are corrupted by their environment. This proved a popular alternative to the doctrine of original sin and has been favored by sociologists who noted correlations between violence and poverty, overcrowding, unemployment, lack of education, inequitable class structures, and racial discrimination. The implication was that improvement of such conditions should reduce violence, but it has not worked out that way. It has not reduced the hard core of personal violence that runs like a crimson thread through the fabric of all societies, in good times and in bad. Over the past sixty years both individual and collective aggression have increased in parallel with material improvements. Are there biological reasons for this vulnerability?

The second impediment is the belief, going back to Aristotle, that brain and mind are separate. This dualism is still prominent

in psychiatry and philosophy but has been rejected by most neurobiologists, who believe that the brain is the organ of the mind "and that the physiological and psychological are but different aspects of the same anatomical substrate" (Ferrier, 1878). The notion that the mind is something separate from the brain can mislead because it focuses attention solely on mental activity, without considering the brain which produces it.

Some find it difficult to accept that conceptual thought can be a function of the brain. Yet, not only is the capacity for abstract thought one of the earliest casualties of diffuse brain damage, but in some cases it can be restored by chemical treatment of the brain, as by the administration of penicillin in syphilitic dementia and lithium in manic-depressive psychoses.

The biological view is that human beings, like the rest of the animal kingdom, are inherently aggressive and that the degree of aggressiveness can be influenced by both biological and social conditions. The reason for believing that man is born aggressive is the demonstration that the human brain contains physical mechanisms for the production and control of both cold blooded predatory aggression for profit, and aggression arising from anger. As long ago as 1892 Goltz demonstrated that in dogs removal of part of the forebrain changes a gentle animal into one which explodes into rage on minimal provocation, and by 1928 the precise anatomical substrate of this emotional reaction had been established by Bard (1928, 1934). Since then it has been proved that

* Read before the American Philosophical Society, 11 November 1982.

there are separate mechanisms for cold blooded predatory aggression on the one hand, and hot blooded explosive rage on the other. These systems do not work in a vacuum, but as a result of interactions between the brain, certain hormones, and the environment.

However, the idea of a neurophysiological basis for aggression was new and as such was destined to have a prolonged period of gestation. Wilfred Trotter, a distinguished neurosurgeon, remarked that the human brain is a good example of immunological principles in that it automatically rejects any new idea. In proof thereof, the great Dr. James Papez nearly lost his position at Cornell in 1937 when he dared to suggest that emotions have an anatomical substrate, namely, the limbic lobe of the brain. But the tide is starting to turn and there is wider acceptance of the fact that in our heads there are built-in mechanisms for aggression which we have inherited from our remote ancestors and which explain much of our irrational and maladaptive responses to real or imaginary environmental challenges.

Although all human brains contain these mechanisms, only a very small proportion of the population is habitually violent in civilian life (Wolfgang 1975, Mednick 1977) because most of us learn to reduce our primitive drives to a socially acceptable level. However, some do not learn to do so because they have been brought up in a subculture where violent behavior is condoned or even encouraged as a means of survival (Wolfgang 1967).

A second and much larger group, said to amount to between three and four percent of the population, consists of people with antisocial personality disorders—a heterogeneous collection which includes those known in the German literature and some American writings as psychopaths. They are found in all social strata from the highest to the lowest and are troublemakers wher-

ever they are found. Recent research has shown that in many of these cases physical defects of the brain are present (Hill 1942, Schulsinger 1977, Mednick 1979, Monroe 1978, Reid 1981, Yeudall 1979).

A third group consists of people who although brought up in non-violent surroundings are recurrently aggressive and lacking in self control but are sane, intelligent, and socially adaptive between their attacks. This condition, episodic dyscontrol, is often associated with physical disorders of the brain (Mark and Ervin 1970; Monroe 1970; Bach-Y-Rita et al. 1971; Elliott 1982). Of course, the antisocial personality disorders and the syndrome of episodic dyscontrol are not the only conditions in which biological factors play a role in antisocial behavior. Explosive violence is seen from time to time in the major psychoses, as well as in so-called borderline syndromes and atypical schizophrenia. It is encountered in some mentally retarded persons, and is a fairly common result of developmental and acquired disorders of the brain dating from infancy and collectively known as minimal brain dysfunction. Aggressive behavior is not uncommon after serious head injuries and may occur for the first time as a result of many other brain insults. Violent behavior is sometimes seen as a result of metabolic disorders; it occurs in some people as a result of a sudden fall in the level of blood sugar, and when this is corrected, they return to normal. A more common example of chemically induced aggression is the extreme violence sometimes seen in otherwise normal women during the week prior to menstruation and apparently due to hormone imbalance. The social impact of this condition has not been thoroughly investigated in respect to family violence, but in one study, 62 percent of the violent crimes committed by a group of women felons was carried out in the five days prior to menstruation and only 2 percent in the post-menstrual week (Morton 1963).

PSYCHOPATHIC BEHAVIORS

Benjamin Rush was one of the first to describe this syndrome and to recognize that it could have a biological basis. In a discourse "Upon the Moral Faculty" delivered to this society in 1786 he reported a typical case, and in 1818 he wrote of "A total perversion of moral faculties" in "persons of sound understanding and uncommon talent . . . who exhibit innate preternatural moral depravity" and he postulated that "There is probably an original defect of organization in those parts of the body which are occupied by the moral faculties of the mind" (Rush 1818).

In this paper the term psychopathy is used to denote the antisocial personality disorder as described by Cleckley (1976). Most of these people appear normal and some are charming and even charismatic. They are not insane, and delusions and other signs of irrational thinking are absent, though at times their behavior is far from sensible. Many are intelligent and some achieve distinction but behind this mask there are grave defects of the personality. They are egocentric and lack the capacity to feel empathy and love. They have little or no conscience or sense of guilt, and tend to project blame when they get into trouble. They are unreliable, untruthful, and insincere, but they are very convincing because they believe their own lies. There is a vast gulf between what they say and what they do. They are impulsive, the whim of the moment being paramount. They lack foresight as regards their own affairs and proceed from one egregious folly to another, though they can advise others wisely and with common sense. They are given to periodic and often senseless antisocial behavior which may be either aggressive or passive and parasitic. As a result of their lack of empathy they are unresponsive in personal relationships and their sex life is impersonal, casual, and sometimes grossly

perverted, especially under the influence of alcohol. Some lack a normal sense of fear, which is often mistaken for courage. Violence, when it occurs, is apt to be cold, casual, and callous and sometimes involves acts of unimaginable savagery.

All these symptoms are not necessarily present in every case (Reid 1981). On the contrary, "partial" psychopaths are more common than the classical core psychopath, sometimes called an anethopath because of a complete absence of the capacity to feel emotion. Henderson (1939), after much experience, preferred to avoid the issue by speaking of "psychopathic behaviors."

In middle age many psychopaths become less antisocial and impulsive. Some gain insight: a man who had spent most of his adult life in prison wrote, "My problem is, I am a rational and good-hearted man who does irrational and harmful things . . . it is as if I was born with a crippling birth defect." Many receive multiple convictions but some are clever enough to avoid the law, or at least, to avoid conviction, and flourish unhindered as social parasites or con men. Others achieve positions of leadership in politics, labor unions, business and entertainment, and a few, whom Henderson called creative psychopaths, achieve fame in the arts because of unusual gifts which, to some extent, blind the public to their behavior (Benvenuto Cellini, Verlaine, Richard Wagner).

When observing the lives of these individuals, whose appearance and conversation are so sane, and whose actions are so often destructive, a nineteenth-century term for the condition—"moral insanity" seems particularly apt. It is difficult for many to realize that moral shortcomings can arise as a result of brain damage. Yet such is the case. It can appear for the first time following a recognized brain insult such as encephalitis or a serious head injury, especially in children. Encephalitis lethargica, now rare, was notorious for the personality



changes it induced in some of the children it attacked. Wilson (1940) described it thus,

The moral and social sense of the patient suffers an eclipse. His misdemeanors range over the whole gamut of juvenile depravity, from lying [sic] and petty pilfering to offenses against the person. Such changes in conduct seem always to be for the worse . . . a child of previously responsible character may be so transformed as to seem a different person. Impish, cruel, destructive, abusive, indecent. He may become guilty of any offense from naughtiness to crime. . . . A creature of impulse, the child's opportunist policy of social offense thrives on the material he finds at hand.

Similarly after serious head injury there is sometimes a gross change of personality. They become aggressive, destructive, quarrelsome, and cruel. They are egocentric and often exhibit total disregard for the welfare of others and a notable loss of affection for the family. They lie and steal, seemingly with total disregard for the consequences. In some there is also evidence of intellectual impairment but it is the change in personality and their liability to explosive rage in response to minimal provocation which are so disruptive.

In most cases of the psychopathic personality, however, there is no history of devastating damage to the brain and anti-social features are first noted by discerning parents very early in life, even in infancy. In some there is a history of severe emotional and social deprivation in infancy and early childhood, perhaps including physical abuse, which seems to retard the social and emotional development of the child although the intellect may remain untouched.

There is a considerable body of evidence to the effect that gross social deprivation in infancy can affect not only the personality, but the brain itself. Baby monkeys removed from parents and peers often grow up into antisocial animals which will abuse their own offspring (Harlow and Mears 1976). Studies of the results of isolation in early

life carried out on rodents, dogs, and monkeys, have demonstrated chemical, microscopic and electrophysiological defects in the brain.

In man, many aggressive psychopaths are found to have abnormal electroencephalograms, commonly with a profusion of slow waves on both sides of the brain which is appropriate for small children, but should not be found in alert adults. This slow activity may therefore betoken delayed maturation of the brain. It is far less common in middle-aged psychopaths than in younger ones.

The role of genetics in the genesis of psychopathy has been emphasized by Schulsinger (1977), Eysenck and Eysenck (1978), Cloninger, Reich, and Guze (1978) and Guze (1976). There is an unusually high prevalence of both psychopathology and abnormal electroencephalograms in the biological parents of first degree relatives of psychopaths, and adoption studies have shown that some offspring of criminal psychopaths who were adopted at an early age by non-psychopathic foster parents subsequently develop antisocial personalities whose misbehavior is certainly not a reflection of their new surroundings.

Neuropsychological tests designed to identify organic brain defects have demonstrated such defects in the majority of *psychopathic* criminals (Monroe 1978, Yeu-dall 1979). Further, it is difficult to establish conditioned reflexes in psychopaths. This is also true of men and animals with acquired bilateral pre-frontal damage. Evidence of neurological dysfunction is supported by galvanic tests of skin resistance which exhibit rather consistent deviations from normal in many psychopaths (Hare 1978).

In conformity with the conclusion that much psychopathic behavior is at least partially biological in origin is the fact that these people do not respond to punishment, rehabilitation, or drugs. It is also generally believed that they are unresponsive to psy-

chotherapy but this may be too pessimistic a view because skillful psychotherapy carried out for some years has had its successes (Carney 1978, Reid 1981). Some of this improvement may have been due to progressive physical maturation of the brain which continues in the prefrontal and anterior temporal cortex until the fourth decade (Kaes 1907, Yakovlev and Lecours 1967).

It is of vital importance that society should learn to identify psychopathic personalities early, and to keep them from high office and other sensitive positions in which their lack of conscience, their egotism, their lack of foresight and their untruthfulness can so easily lead to disaster, not only to themselves, but also to those who depend on them—for example, Alcibiades, Nero, Hitler, Stalin; and perhaps others nearer home.

THE EPISODIC DYSCONTROL SYNDROME

Recurrent attacks of uncontrollable rage, with or without external provocation, were recognized by nineteenth-century physicians as an occasional symptom in epileptics, and were accurately described by Kaplan (1899) as a sequel of severe head injury. In 1956 Karl Meninger and Martin Mayman used the word 'dyscontrol' for repeated attacks of aggressive behavior encountered in a psychiatric setting and in 1971 a group of Harvard psychiatrists described 130 self-referred patients who had reported to psychiatric clinics in Boston because of explosive outbursts which they were unable to control (Bach-Y-rita 1971). Careful examination of these patients disclosed that an unduly large number had an early history of brain damage or other illness which could have caused it. Since that time neurological investigation of a larger number of cases—most of whom had been guilty of spouse battery or child abuse—confirmed that biological abnormalities are far more common in people who are liable to explosive rage

than they are in the general population (Elliott 1982). It is not known, however, whether the high prevalence of biological defects in these groups would be present in wife batterers and child abusers who never seek medical help.

The attacks which are characteristic of this syndrome are unlike ordinary anger in response to frustration, and patients who have experienced both conditions can recognize the difference. The rages are not part of a general chronic malevolence, but are episodic and the attacks come on rapidly, often without warning, and usually without obvious internal or external provocation. There is a drastic change of personality, voice, and manner. The violence often has a primitive quality—gouging, kicking, clawing, biting, spitting—and the attacks are carried out so quickly and with such power that the victim is hard put to escape. A 16-year-old boy tore the door off a refrigerator. A young woman weighing 105 lbs. threw a large upholstered arm chair over the dining room table at her husband. A youth split the panel of an oak door with a single karate-like blow of his hand. There is a fiendish savagery about some of these attacks, as in the case of a cultivated woman who bit deeply into the throat of her baby because her crying annoyed her. A pleasant young man, enraged by the fact that his girl would not come out with him for the evening, thrust the barrel of a toy gun down the throat of a five-year-old boy whom he encountered as he left the house. A case is recorded of a father who in a burst of fury dragged his 6-year-old son into his workshop, seized an electric drill, and drilled a hole through his heart. Most of these people are guilty of other acts of violence as well—aggressive driving, willful destruction of property and furniture, and cruelty to animals.

In some cases violence is not physical but verbal. This is more common in women than in men. The language used is usually

obscene and profane and in some the words are so garbled as to be indistinguishable. A cultivated Quaker lady who had been subject to such verbal attacks since a severe head injury 40 years before, walked into a social gathering, to stand glaring with a look of hatred at her husband, mumbling words through foam-flecked lips, growling and showing her teeth like a dog. Such verbal attacks on spouse or children are sometimes sufficient to precipitate divorce and create psychological problems in some of the children. In most cases the attacks are followed by remorse, although in circles where violent behavior is a cultural norm, the aggressor may feel no guilt.

In 102 out of 286 cases studied over a period of 11 years, the episodic dyscontrol developed for the first time following a specific brain insult such as a head injury, encephalitis, stroke, or brain tumor, and was plainly the *result* of brain damage. In the remainder it had been present since early life, starting as temper tantrums of childhood, and was usually associated with developmental defects, birth damage, or perinatal disasters which may or may not have caused the dyscontrol.

Two thirds of the entire group were psychiatrically unremarkable between their attacks. The remainder presented a continuum of abnormalities ranging from eccentricity through neurosis to borderline psychoses or psychopathy. (Overt psychopaths and psychotics were excluded from the study as were the mentally retarded and individuals whose aggression was solely drug related.)

These were private patients drawn from the middle and upper socioeconomic classes, 95 percent were white, and most of them were young. There were three times as many men as women. Very few had had contact with the courts as a result of their violence and only ten had been in prison—8 of them for killing 19 people.

As a result of neurological examination

fortified by electroencephalography, neuropsychological tests and CAT scans, evidence of developmental or acquired neurological defects were found in 94 percent of the group (Elliott 1982). Most of the remaining 6 percent gave a family history of explosive behavior going back two to three generations and affecting about half the siblings in each generation. Davenport (1915) found similar evidence of genetic transmission in 79 young women whose explosive rage had contributed to their felonies. This should not surprise us. Breeding experience in animals has shown that there are genetically transmitted predispositions towards aggressive behavior which interact in a complex manner with environmental conditions. Selective breeding has been in use for generations to produce aggressive bulls for the bull ring and aggressive birds for cock fights, and selective breeding under controlled laboratory conditions has produced highly aggressive lines of dogs, Australian dingoes, guinea pigs, mice, and even rabbits (Ginsberg 1979). Care must be used not to assume that when "violence runs in the family" it is always or solely something which the individual has learned from parents or siblings—a common error.

Alcohol, even in small amounts, can trigger explosive rage and contribute to the amnesia which often follows such episodes. In some, violence occurs only after taking large amounts of alcohol over a few hours. The aggressor, who may not appear drunk in the ordinary sense of the word, can be responsible for vicious attacks on friends, family, or complete strangers, and has no memory of what happened. Between the incidents they usually appear to be pleasant, kindly, and considerate.

Alcohol depresses conscience, foresight, judgment, and emotional control, particularly in psychopaths and brain-damaged individuals. It plays a role in more than half the fatal accidents on the road and in 60 percent to 80 percent of spouse battery and

child abuse. Drugs have variable effects depending on the identity of the substance, the mood of the individual, and psychosocial variables. Alcohol, plus barbiturates, usually increases aggression, while marijuana commonly reduces it. But alcohol, even in modest amounts, is the main enemy.

The site of the brain damage responsible for episodic dyscontrol is usually impossible to identify, because the pathology is too diffuse, as for instance, in encephalitis and head injuries. However, this does not apply to small brain tumors of which there were 13 in this series. In each case the tumor was situated in deep portions of the brain which are phylogenetically ancient relics of our reptilian and early mammalian ancestors. This finding is consistent with results of both experimental and clinical studies in man and animals, namely that explosive rage is a result of damage to the old brain and not to the neocortex of the cerebral hemispheres—a fact discovered by Philip Bard in 1928.

The identification of physical disorders in these individuals is of practical importance in choosing the treatment most likely to help control their aggressive behavior. Psychotherapy and counseling are important, but it is biological treatment, by drugs and hormones, which has produced the most convincing control of symptoms even if the underlying pathology cannot be remedied. For those whose attacks cannot be controlled, refined surgical techniques are available which do not produce the disastrous complications which sometimes followed the old fashioned lobotomy or leukotomy a half a century ago.

EPIDEMIC VIOLENCE

We have seen that in the antisocial personality disorder and the episodic dyscontrol syndrome structural and physiological abnormalities of the brain are associated with and probably contribute to violent be-

havior. However, such physical defects cannot explain either the aggressiveness of normal individuals under extreme stress, or the present worldwide explosion of personal violence. Both are environmental in origin, yet—as will appear—here, too, biological factors play a role.

Some apparently normal people accept violence as a social norm because they are part of what Wolfgang (1976) has called a "subculture of violence," meaning that the prevailing habit of a group is to accept aggression as a mode of personal interaction and a device for solving problems. Such people are found in "pockets of population characterized by residential propinquity and a shared commitment to the use of physical aggression." In these small areas Wolfgang found much physical punishment of children, much child abuse, many street gangs, and frequent brawls. A young woman from a New York slum said on television that if she had children she would teach them to use a knife and a gun and to be sure to hit first. Such violence is a learned behavior and is regarded as necessary for survival, but it is possible that investigation of such groups might disclose antisocial personality disorders among the leaders.

A second and more serious example of environmental determinism is the present epidemic of personal and collective violence. Similar self-limited outbursts have occurred in the past during and after periods of great social, political and philosophical change, as in the fourteenth century after bubonic plague had wiped out an estimated one third of Europe's population, and after the Civil War in the United States and World War I in Europe. It was also seen in Colombia from 1948 to 1958, a period of unparalleled carnage and mass atrocities with an estimated 100,000 deaths. Historians will recall other examples.

During these dark periods the escalation of violence is usually accompanied by other evidence of social regression—total egocen-

tricity, erosion of personal integrity, a drying up of compassion and altruism, widespread dehumanization, unbridled material greed, a descent of sexual mores to barnyard levels, corruption in high places, a lust for cruelty and sexual perversion in entertainment, and a recourse to demonology.

The cause of such epidemics has been lucidly stated by George Kennan (1954).

Whenever the authority of the past is too suddenly and too drastically undermined—when, above all, the experience of the father becomes irrelevant to the trials and searchings of the sons—there the foundations of man's inner health and stability begin to crumble, insecurity and panic begin to take over and conduct becomes erratic and aggressive.

This, of course, was the message of "Lord of the Flies" and Kennan's diagnosis is supported by the relative immunity from aggression enjoyed by societies which have maintained their religious and secular controls. The Japanese, for instance, have escaped the worst of the epidemic, (in 1980 they suffered only 48 deaths from handguns as compared with 10,728 in the United States.) and the same is true of many small religious communities in our midst—*islands of stability in a turbulent sea.*

Emil Durkheim (1897) used the word *anomie* for a state of affairs when there is a weakening of rules of behavior and when desired goals are not realizable through legitimate means. He pointed out that under such conditions many feel lost, powerless, and frustrated, and exhibit deviant behavior, including suicide. A physiological parallel is supplied by Pavlov (1941). He found that the behavior of dogs that had been conditioned by a system of rewards and penalties to respond to a bell, or to small electric shocks delivered at regular intervals, was disturbed by sudden changes in the conditions of the experiment, as for instance, by altering the intervals between signal and reward, by giving positive and negative sig-

nals in a confusing sequence, and by sudden changes in the strength of the signal. The result was confusion, erratic behavior, irritability and eventually, apathy and indifference. All animal trainers know the truth of this principle of consistency.

It seems that man requires environmental assistance to buttress the rather fragile internal controls that he is supposed to exercise on his primitive drives. If it is agreed that the brain is the organ of thought, emotion, and behavior, then the deviant and self destructive activities of people under conditions of anomie must have a physiological basis. What is it that makes us so vulnerable to regression when the props are withdrawn? Where lies the fatal flaw? The ancient Greeks, aware of this weakness, used the word, "*hamartia*," for the supposed constitutional defects which led some of their heroes to inevitable destruction. Psychoanalysis can explain the psychodynamics of these maladaptive responses, but cannot define their anatomical/physiological basis.

Paul MacLean (1973) has suggested that there is indeed a fatal flaw in the human brain and that it has an anatomical and evolutionary basis. He points out that we really have three brains. This triune complex consists of three integrated elements which we have inherited from our ancestors (figure 1). The central core corresponds to the reptilian brain which persists almost unchanged within the human brain. It has a limited repertoire of functions relating to survival of self and the species including control of territory, mating, breeding, hunting, feeding, fighting, fleeing, and the maintenance of simple hierarchies. This phylogenetically ancient structure is also present in the early mammals but in them its upper end is encircled by a new structure, the limbic lobe, which is the anatomical substrate of emotions and emotional responses such as pleasure, fear, rage, and grief. This system, together with a slightly enlarged cerebral cor-

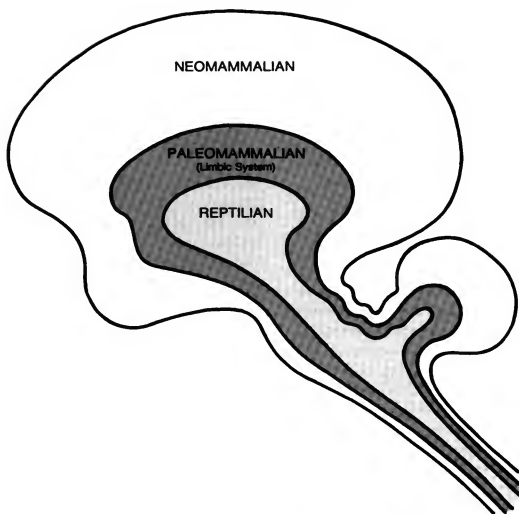


FIG. 1. The triune brain. Schema of the three basic types of brain which man has inherited from his ancestors. (Courtesy Dr. P. D. Maclean)

tex greatly increased the behavioral repertoire of the early mammals compared to the reptiles. Eventually with the arrival of primates these two structures were topped by a vastly enlarged cerebral cortex—the neocortex—of the hominid line.

The acquisition of the neocortex is responsible for a great increase in memory, intelligence, judgment, foresight, logic, and sensory perception, has allowed us to develop speech, and contributes largely to the amazing dexterity of the human hand, without which there would be no writing, no art, and no tools or machines. It is the neocortex that has put men on the moon and given us not only Shakespeare's sonnets, but also the ability to destroy life on this planet. Unhappily—and this is the flaw—the logical cortex, though intimately connected

with the other two elements of the triad, is not always able to control the primitive drives of the reptilian and early mammalian components.

Under normal conditions the neocortex exerts a considerable degree of control on these lower levels. As a result of the training we receive from infancy onwards we have learned to inhibit angry aggressive behavior, socially unacceptable predatory aggression, inappropriate sexual drives and excessive material acquisitiveness. However, the inhibitory mechanism is fragile and can break down in the face of powerful sexual drives or overwhelming rage, or panic, or mental illness, or in the competition for food during famine, or as a result of organic defects of the brain or from intoxication by alcohol and drugs. And, as we have seen, it also

happens to some apparently normal people when cultural restraints are too suddenly removed.

Clearly the inability of the thinking cortex to exert complete and consistent control over our primitive drives lies at the root of much of the human predicament. Nevertheless, there is hope. Civilization has survived other periods of anomie and many cultures throughout history have succeeded in taming individual aggressiveness and in teaching the young to work for the common good. How this can be done is implicit in the Kennan hypothesis, for if sudden and drastic changes in the rules of behavior weaken our capacity to control primitive drives, the answer to our present malaise must be the reimposition of the social and educational restraints which have proved effective in the past, coupled perhaps with the use, not of a magic pill as suggested by Arthur Koestler, but of new measures prompted by increased knowledge of the biosocial bases of aggressive behaviors which, however useful they may have been to primitive man, are handicaps in the world of today.

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The Philosophy of H. L. Mencken*

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During the 1920s, when he was at the peak of his literary fame, H. L. Mencken became widely known as the "Sage of Baltimore." Mencken was busy in those days editing *The American Mercury* and preparing revised editions of his most famous book, *The American Language*, and he made no comment on being called a sage; but when some people began to call him the "Baltimore Philosopher" he objected.

In 1927 he wrote an essay called "On Metaphysicians," which was Mencken's word for philosophers, and in it made clear that he did not want to be known as a philosopher. He started his essay by saying that when Baltimore got too hot for what he called "serious mental activity," he always took a couple of weeks off for a "rereading of the so-called philosophical classics with a glance or two at the latest compositions of the extant philosophers."

He explained his annual trip into the forests of philosophy by saying,

There is somewhere down in my recesses an obscure conviction that I owe a duty to my customers, who look to me to flatter them with occasional dark references to Aristotle, Spinoza and the categorical imperative. Out of this business, despite the high austerity, I always carry away the feeling that I have had a hell of a time. That is, I carry away the feeling that the art and mystery of philosophy as it is practiced in the world of professional philosophers, is largely moonshine and wind music—or, to borrow Henry Ford's searching term, bunk.

Since the dawn of time," he continued,

they have been trying to get order and method into the thinking of Homo Sapiens, and Homo Sapiens, if he thinks at all, is still a brother to the lowly ass (*Equus Africanus*), even to the ears and the bray. I include the philosophers themselves unanimously and especially. True enough, one arises now and then who somehow manages to be charming and even plausible. I point to Plato, to Nietzsche, to Schopenhauer. But it is always as a poet or politician, not as philosopher. The genuine professional, sticking to his gloomy speculations, is as dull as a table of logarithms. What man in human history ever wrote worse than Kant?

Mencken then went on to define the problem with philosophers this way: "What reduces all philosophers to incoherence and folly, soon or late, is the lure of the absolute. . . . For the absolute, of course, is a mere banshee, a concept without substance or reality. No such thing exists."

Mencken's long experience as a reporter and editor probably was what caused him to feel so strongly that absolute truth did not exist. He knew from sad experience with newspapers how difficult it was to come by the facts of events as recent as yesterday.

Mencken's own part in the history of the bathtub in America was a case in point. A great amount had been written about bathtubs in ancient Greece and Rome, but when Mencken became interested in them he found that nothing at all had ever been written about bathtubs in America. So he wrote the first piece on the subject and had it published in the *New York Evening Mail* of 28 December 1917.

* Read at the Autumn Meeting of the Society, 11 November 1982.

He called his piece "A Neglected Anniversary" because, he said, no attention had been given to the seventy-fifth anniversary of the installation of the first true bathtub—one with pipes carrying in hot and cold water and others to carry away the spent water—ever set up in the United States.

This bathtub, Mencken reported, had been completed on 20 December 1842, in the home of Adam Thompson, a Cincinnati grain merchant who shipped much of his grain to England. During visits to customers in England Thompson became familiar with bathtubs and decided to install one in his own house.

Thompson's tub was a large thing made of mahogany wood and lined with lead, weighing in all 1,750 pounds. It was supplied with water from a third-floor tank, and some of the water was heated by running it through a long copper coil in the chimney of the fireplace. Thompson liked his new tub and invited several other wealthy Cincinnatians to try a bath in it. They liked it too, and soon there were several bathtubs in Cincinnati and the newspapers there ran stories about them.

Whereupon a surprising reaction to use of the bathtub occurred.

"On the one hand," Mencken wrote, "it was denounced as an epicurean and obnoxious toy from England, designed to corrupt the democratic simplicity of the republic, and on the other hand it was attacked by the medical faculty as dangerous to health."

Mencken went on to quote from the *Western Medical Repository* of 23 April 1843, which called the bathtub a certain inviter of "phthisic rheumatic fevers, inflammation of the lungs and the whole category of zymotic diseases."

Nevertheless, news about the bathtub spread and soon tubs were being installed in other cities, which developed controversies of their own. Hartford, Providence, Charleston, South Carolina, and Wilming-

ton, Del., all put special water taxes on homes with bathtubs, Mencken reported; and Boston in 1845 made bathing unlawful except upon medical advice. But this ordinance was never enforced and was repealed in 1862. The repeal was a slow reaction to the fact that the American Medical Association had met in Boston in 1852. A poll of the membership showed that nearly all the doctors present then thought bathing was harmless, and 20 percent advocated it as beneficial.

However, the thing which really caused the bathtub to flourish in America, Mencken reported, was the example set by President Millard Fillmore. Fillmore had visited Cincinnati on a political tour in 1850 and had taken a bath in the original Thompson tub. To quote Mencken: "Experiencing no ill effects, he became an ardent advocate of the new invention," and when he succeeded to the presidency, after Taylor died on 9 July 1850, he had his Secretary of War, General Conrad, install one in the White House.

"This action," Mencken reported, "revived the old controversy and its opponents made much of the fact that there was no bathtub at Mt. Vernon or Monticello, and all the Presidents and magnificos of the past had got along without such monarchical luxuries."

Nevertheless, the bathtub prospered greatly after Fillmore's term as president, and by 1860, according to newspaper advertisements, every hotel in New York had a bathtub and some had two or even three.

Mencken closed his story for the *Evening Mail* this way:

So much for the history of the bathtub in America. One is astonished, on looking into it, to find that so little of it has been recorded. The literature, in fact, is almost nil. But perhaps this brief sketch will encourage other inquiries and so lay the foundation for an adequate celebration of the Centennial in 1942.

However, for the next nine years, no one wrote anything else about the bathtub, al-

though Mencken's account was reprinted in over a hundred magazines and newspapers, and excerpts from it appeared in history books and encyclopedias. One item in particular—Fillmore's installation of the first White House bathtub—fascinated historians and it was recorded in a multitude of places. Fillmore, in fact, became known during the 1920s as "the first clean president."

Then almost a decade after he wrote his story for the New York *Evening Mail* Mencken wrote a follow-up piece, which appeared in the *Chicago Tribune* of 23 May 1926. In this new story Mencken admitted that the first piece was totally a product of his own imagination.

"This article," he wrote in the *Tribune* story, "was a tissue of absurdities, all of them deliberate and most of them obvious. . . . If there were any facts in it they got there accidentally and against my design."

Mencken went on to say that he had liked his fabrication and was at first pleased when so many newspapers across the country reprinted it. Then he became alarmed because

I began to encounter my preposterous 'facts' in the writings of other men. They began to be used by chiropractors and other such quacks as evidence of the stupidity of medical men. They began to be cited by medical men as proof of the progress of public hygiene. They got into the learned journals. They were alluded to on the floor of Congress. They crossed the ocean and were discussed solemnly in England and on the Continent. Today, I believe, they are accepted as gospel everywhere on earth. To question them becomes as hazardous as to question the Norman Invasion.

This exposé was reprinted in twenty or thirty major newspapers, and then a very curious situation developed. No one paid any attention to this exposé. Two weeks later the Boston *Herald* reprinted the original hoax as an interesting piece of American history. Of course, no one corrected the history books, which had faithfully reproduced parts of it, particularly the item about Mil-

lard Fillmore putting in the first White House bathtub.

Mencken made one more attempt to debunk his bathtub hoax, and on 25 July 1926 wrote another piece on the subject for the *Chicago Tribune*, once again calling his original story a fake.

Again, very few people apparently paid any attention to the exposé, and the original story kept right on gaining credibility and acceptance. And it kept on doing so long after Mencken died. Dr. Daniel Boorstin, Librarian of Congress, for example, included the most intriguing of Mencken's "facts" in his scholarly book *The Americans—The Democratic Experience*, published by Random House in 1973. On page 353 Dr. Boorstin wrote: "In 1851 when President Millard Fillmore reputedly installed the first permanent bathtub and water closet in the White House he was criticized for doing something that was 'both unsanitary and undemocratic.'"

Dozens of other authors have done the same thing, the two most recent being Barbara Seuling in 1978 and Paul Boller in 1981. Boller's book, called *Presidential Anecdotes*, was published by the Oxford University Press.

Also, all three of the national TV networks reported in 1976, on 7 January the occasion of Fillmore's birthday, that he had installed the first White House bathtub.

All this has occurred despite the fact that many newspapers have exposed Mencken's fake over the years. For example, on 4 January 1977, the *Washington Post* exposed it once more but the *Post* closed its story on a note of optimism: "Will this current account" the *Post* asked,

destroy one of the nation's most charming myths? Certainly not. It will not even slow it up any more than a single grape placed on the railroad tracks would slow up a freight train.

So on January 7, let all true patriots retire to their bathrooms, fill up the tub with champagne, invite the neighbors in, and drink a toast to Mil-

lard Fillmore, statesman, scholar, patriot, and the finest plumber who ever lived in the White House.

The *Philadelphia Inquirer* of 7 January 1977, carried a similar story, which was headlined: "A Dirty Story. Fillmore's Still in That Tub."

And so it goes. The original hoax has become indestructible, while all attempts to correct it got nowhere. Mencken explained all this in his essay which he called "Hymn To The Truth" written for the *Chicago Tribune* in 1926.

"No normal human being," he wrote, "wants to hear the truth. It is the passion of a small and aberrant minority of men, most of them pathological. They are hated for telling it while they live, and when they die are swiftly forgotten. What remains to the world, in the field of wisdom, is a series of long-tested and solidly agreeable lies."

In another essay called "The Art Eternal" Mencken stated his views in a somewhat similar manner, declaring that Americans were particularly resentful of the truth. "A Galileo," he wrote, "could no more be

elected President of the United States than he could be elected Pope of Rome. Both high posts are reserved for men favored by God with an extraordinary genius for swathing the bitter facts of life in bandages of soft illusion."

Mencken closed his 1927 essay on philosophers this way:

There is no record in human history of a happy philosopher: they exist only in romantic legend. Practically all of them have turned their children out of doors and beaten their wives. And no wonder! If you want to find out how a philosopher feels when he is engaged in the practice of his profession, go to the nearest zoo and watch a chimpanzee at the weary and hopeless job of chasing fleas. Both suffer damnably and neither can win.

So it is clear why Mencken did not wish to be called a philosopher.

Nevertheless, he had a philosophy of his own. Mencken believed that the list of eternal truths is a very short one and if a man happens to come across what he believes to be one of these eternal truths he still should not take it too seriously.

The Perception of Risk in Nineteenth Century Anthracite Mining Operations*

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INTRODUCTION

The nineteenth-century landowners, miners, and mine operators of the anthracite district of Pennsylvania present the historian with a difficult problem of explanation. How could these men have persisted in the mining of coal for decades under circumstances of production that gave the underground miner a less than even chance of getting through fourteen years of work without a fatal or crippling accident, and gave the colliery operator a less than even chance of getting through only one year without going out of business? In this paper I shall concentrate on the mine operators and landowners of St. Clair, a small mining town in Schuylkill County, about ninety miles north of Philadelphia. They were responsible for making decisions about the technology and management of the mines and their behavior is recorded in business records, correspondence, and mine inspectors' reports. First, I shall describe certain deficiencies in the technology employed in the deep shaft mines about St. Clair (and elsewhere in the anthracite district) as compared with prevailing British practice. Second, I shall present evidence to show that the rate of industrial accidents resulting from the use of this flawed technology was extremely high, indeed so high that it may have been in large part responsible for the

economic problems of the local industry in the period 1850 to 1880. And third, I shall address the problem of explaining how well-informed men were able to persist for years in investing time and money in a technology that had a high probability of failure. They were eventually saved, in part at least, by state safety legislation passed over their own objections.

THE DEEP SHAFT MINE

By the early nineteenth century, when Americans first began to mine the hard coal deposits of Pennsylvania, their British forebears had been mining coal for hundreds of years. British efforts to solve the problem of pumping water out of coal mines led directly to the development of the first commercial steam engines by Savery and Newcomen; and the Royal Society concerned itself with the problem of coal mine ventilation as early as 1662. During the eighteenth century, as coke replaced charcoal in the smelting and refining of iron, coal became indispensable as an industrial fuel. Most of the British coal lay in great horizontal sheets and the only practical means of reaching it was by means of vertical pits hundreds or thousands of feet deep. By the beginning of the eighteenth century, depths of three hundred feet were common; by the middle of the nineteenth century, some British coal mines reached depths exceeding 2,000 feet. In order to maintain a constant influx of fresh air into, and an efflux of foul air out

* Read before the American Philosophical Society, 11 November 1982.

of the mine, two pits were needed at each colliery, one for the upcast and one for the downcast. The air coursed between them through miles of gangways, gathering the explosive firedamp (methane gas), smoke, carbon dioxide, and other effluvia and exhausting them through an upcast that usually was the chimney for a furnace whose hot ascending gases aided the ventilation. Pumps and pipes were located in the upcast and the hoisting compartments were in the downcast. The pits were generally round or oval and were lined with two feet of stone or brick, with iron tubing added to hold back water when passing through aquifers (Scotland was an exception, favoring rectangular pits lined with timber). The two pits might be dozens or even hundreds of yards apart; each had its own steam engine, and in the best mines a back-up windlass or whim, powered by horses, to provide an emergency hoist if the engine failed. In the best mines, furthermore, arches of brick or masonry were used underground to support the roof at the bottom of the pit and even in the gangways. The essential passageways of a mine so constructed were thus fireproof and able to withstand both the pressure of the overlying rock and also the blast effects of minor methane-gas explosions.¹

There were some modifications of this plan, which was best adapted to the relatively level seams of bituminous coal in the north of England, in regions where the coal seams undulated and at times cropped out on the surface. This was particularly the case in the newly developed anthracite districts of south Wales in the 1850s. Here in some cases slopes instead of pits were sunk, starting at the outcrop and slanting down through the coal itself to the bottom. An American traveler in 1856 described a new slope near Swansea which was being driven to a depth of 1,800 feet. It was ten feet wide and eight feet high. The roof was built of small dressed stones in the shape of an arch; no mortar was used. To provide ventilation,

this slope was bratticed by a wooden partition in the middle that divided it into upcast and downcast airways, and the upcast at the mouth was diverted into a culvert that ran up the mountainside about 150 feet to a furnace and a chimney about 50 feet high. The operators, "should the mine prove to be very fiery," planned to substitute brick for wood in the brattice later on.² In the early part of the century, brattices had also been used to save the expense of a second pit in some very deep vertical shafts in the bituminous fields; but again, the sides were constructed of stone or brick. The brattices or partitions divided the upcast from the downcast in the single shaft. But these single shaft collieries came under severe criticism as excessively dangerous and were outlawed by Parliament in 1862 after the Hartwell Colliery disaster in which over 200 men were asphyxiated when the brattices were broken and the ventilation suspended. Thus by the 1850s, most new collieries had two separate pits for upcast and downcast.³

Knowledge of these methods of working were undoubtedly brought to America by the experienced English, Welsh, and Scottish miners who were imported by the hundreds to work the new anthracite collieries from the 1830s on. Some of these men, including the Welsh Johns family who operated the only successful colliery at St. Clair, put British expertise to work in the design of their mines. There were also available published British treatises on colliery design, from Holland's 1835 survey of the fossil fuels and collieries of Great Britain to manuals on mine ventilation and other technical aspects of design that began to appear as early as 1851.⁴ And the best British standards of practice were deliberately brought to the attention of American mine operators by the influential newspaper of the coal trade, the *Pottsville Miners' Journal*, which beginning in 1855 ran a series of letters to the editor by a young American railroad engineer, William Jackson Palmer, traveling

on foot through the mining districts of Great Britain.⁵

The first vertical deep-shaft (450 feet) coal mine in the southern anthracite field was sunk at St. Clair in 1854 by engineer Enoch McGinness on the land of Henry C. Carey (retired publisher, economist, and member of the American Philosophical Society) and his brother-in-law Isaac Lea (publisher, paleontologist, and also a member of the Society). Despite the availability of British know-how, McGinness introduced several modifications of best British practice that turned out to be, in combination, a lethal innovation. First, instead of sinking two separate pits (or shafts, as they were called in Pennsylvania) for the downcast and upcast airways, a single shaft was constructed, divided by several wooden brattices so that the compartments for hoisting and pumping equipment were also the two airways. Second, the shaft was (as in Scottish mines) lined with wood rather than stone or brick. Third, the furnace was placed at the bottom of the shaft, using one of the wood-lined compartments as a chimney, rather than on the surface in the foot of an external stack. And finally, the large wooden breaker (a recent American innovation) with its associated steam engines and oil lamps, was constructed on top of the shaft itself so that the coal coming up from the mine could be dumped directly into the machinery for crushing and sizing without the cars being removed from the hoisting cage.⁶

DISASTER

The result of these arrangements was a mine highly vulnerable to catastrophe. A fire, whether originating in the breaker or at the bottom of the shaft, would destroy the wooden lining of the shaft, ruin the pumps, render the hoisting apparatus inoperative, and stop the ventilation. Men and animals in the mine would be suffocated or drowned (if not killed in a preliminary

methane explosion); the mine might begin to burn internally; it might fill up with water (or would have to be flooded to put out the fire), and the operator would have to spend months or years getting it back into operation. Such a disaster occurred in the St. Clair Shaft in August 1856, less than two years after the mine had commenced operation. Fortunately the fire occurred at night when there were no men underground. The sequence of events was as follows: some men were at work in the pump house, next to the breaker, repairing the pumps by the light of an oil lamp; this lamp set fire to a tarred rope hanging from the roof, and the pump house burned, setting fire to the breaker. The breaker burned and collapsed into the shaft, destroying the pumps in the process. By morning the fire was out but the water was rising in the shaft.⁷ The fire loss amounted to between \$30,000 and \$40,000 and insurance totaled only \$15,000. It was not until twenty months later that the engines and pumps were replaced, the breaker rebuilt, and the mine was able to ship coal again. But the new pumps were not large enough, the mine flooded repeatedly, and the lessees sold out three years later, in the 1861. Three more lessees tried, and failed, to operate the mine profitably. Then, it was purchased and briefly operated by the Philadelphia and Reading Coal and Iron Company, which finally closed it down in 1874, almost twenty years to the day from the time it opened. During the thirteen years from 1861 to 1874 the mine was suspended for a total of five years, of which four were the result of a second breaker fire that set fire to the shaft and destroyed the pumps so that the mine filled with water again.⁸

Fires in breakers constructed directly above the shaft obviously also had the potential for extensive loss of life, if they occurred when men were working underground. The major disaster finally occurred in September 1869 at Avondale, along the

Susquehanna River south of Wilkes-Barre. Flames from the furnace ignited the shaft, which in turn ignited the breaker above; flaming timbers from the breaker and iron from the hoisting frame collapsed into the shaft, stopping the ventilation and blocking the only exit. About 115 men died, most of asphyxiation; there were no survivors. The public outcry over this calamitous repetition of the Hartwell disaster forced a reluctant state legislature to pass an improved mine safety law that required all mines to have a second shaft, or slope, that could be used for an emergency exit as well as for ventilation.⁹

In addition to the supremely disastrous shaft-and-breaker conflagration, there were other economic risks from physical disaster. One of these, equally destructive to the mine, but less hazardous to human life, was the underground coal fire (of which the Centralia fire is the best-known present-day example). Such fires were becoming common in the 1850s and resulted in the abandonment of the mine if flooding it with water did not totally extinguish the flames. Ignition was usually blamed on careless miners but probably was in many cases the result of spontaneous combustion of coal in old, abandoned gangways and breasts where loose piles of rock and coal lay exposed to the air. Under such conditions heat released by slow oxidation could rise to ignition temperature.¹⁰

Another, chronic problem was the increasing difficulty of maintaining adequate ventilation through airways of fixed size as the extent of the mine increased over the years. A mine at its inception had gangways totaling a few hundred yards; fifteen years later, there would be ten or fifteen miles of gangways. To further complicate the problem of ventilation, in Schuylkill County, where the veins pitched at angles of up to eighty degrees from the horizontal, the working face of coal was at the top of a chamber as much as three hundred feet

long. Methane naturally accumulated at the top of these chambers where it could easily be ignited by a miner's lamp (even safety lamps were not completely safe). The isolation of much of the methane in individual chambers protected the mine against disasters like the massive catastrophes in English bituminous mines, where hundreds died in each explosion. But it did result in frequent local explosions of fire damp that killed, or seriously burned, the miner, laborer, and mule-driver working in or near the chamber. If a mine was fiery, and earned from the deaths of miners a reputation for being badly ventilated, the operator faced the possibility of having to pay higher wages in order to keep his men.¹¹

THE MAGNITUDE OF HAZARD

It is possible, by historian's hindsight, to obtain a rough measure of the frequency of major disasters—underground fires, explosions, floods, and breaker burnings that closed down collieries for months or years—between 1854 and 1884 in the St. Clair area. For the mines operated on land owned by the Henry C. Carey connection, there are both Carey's own correspondence and legal records, between 1854 and 1872; and for the mines on adjoining lands owned by the Wetherills (one of whom, John Price Wetherill, was a mining engineer and a member of the American Philosophical Society), the annual published reports of the Pennsylvania mine inspector, beginning in 1869, carry the record forward to 1884 when the bankrupt Philadelphia and Reading closed down all of its shafts around St. Clair. I consider the disaster and production records on the following three major shaft collieries at St. Clair sufficiently complete: the St. Clair Shaft (1854 to 1874), which experienced 2 explosion/fire/flood sequences in its 20 years of operation; the Wadesville Shaft (1868–1884), which was planned by the prominent mining engineer P. W. Sheaffer,



also a member of the American Philosophical Society, and which experienced no less than 5 in its 16 years; and the Pine Forest Shaft (1868-1884), which so far as I know suffered no major catastrophe, but which closed down at least twice for ventilation improvements before its final abandonment. In the total of 52 colliery—years between first hoisting coal and taking out the pumps in these three mines, there were thus at least 7 major disasters; the probability of getting through a single year safely was only .865; the operator had a less than even chance of making it through 5 years without a fire-and-flood catastrophe.¹²

THE PERCEPTION OF RISK

We have before us, then, the thirty-year history of a technological experiment that failed: the attempt to mine anthracite from steeply pitching veins near St. Clair, Schuylkill County, Pa., by means of deep, furnace-ventilated vertical shafts that differed from English shafts in being lined with wood instead of brick or masonry and (for half the period) in having the upcast and downcast airways placed within a single wood-bratticed shaft instead of in two separate pits. The hazards inherent in this arrangement are obvious to the historian; and they soon became obvious to the Philadelphia and Reading Coal and Iron Company, which after taking over most of Schuylkill County's minelands and mines, suffered two bankruptcies caused in large part by the losses entailed by its shaft collieries. When the company reorganized in the second half of the eighties, it abandoned most of its shafts, including Wadesville and Pine Forest, and returned wherever possible to the older, and more reliable, slope method of working in steeply pitching veins.

But it is of interest to ask what was the perception of risk among the entrepreneurs, engineers, and supervisory employees responsible for the sinking and early opera-

tion of the three shafts? Fortunately we can infer something of the thinking of these persons from published statements and unpublished correspondence, and in what follows I shall attempt to present a synthesis of this material.

There were certain constraints upon the overt recognition of risk by Schuylkill County entrepreneurs that grew out of the economic organization of the coal trade in that county. First of all, these collieries were poorly capitalized ventures in comparison with British mining companies and even with the railroad corporations that owned the Pennsylvania mines outside of Schuylkill. The typical colliery operator opened his mine deeply in debt and faced with the immediate necessity of paying royalties to the landowner, tonnage payments to the contract miners and wages to day workers, and repaying at least some part of his borrowed capital. Hence he was apt to be desperate to sell coal and highly motivated to postpone completing various parts of the mine's design, such as the ventilation, until sufficient coal had been sold to pay initial short-term borrowing and operating costs. The most immediate economic risk to the colliery operator was, by failure to pay money he owed, being forced to sell the colliery to satisfy demanding creditors. Any one, or combination, of a number of things could bring about this financial collapse, including lowered selling prices for coal, raised transportation costs, and of course any event that interrupted the production of coal.¹³ As Eckley B. Coxe, the most scientific of all the early operators (and a member of the American Philosophical Society) testified before the U.S. Congress in 1888, "There is no business on the face of the earth subject to as many casualties [as the mining of coal]."¹⁴ Thus the risk of losing the colliery as a result of an explosion-fire-and-flood catastrophe, large as it may have been, could very well have been perceived as less likely than the risk of losing the colliery as a result of a

failure to sell enough coal fast enough at a price high enough to pay current obligations.

Second, colliery operators carefully separated consideration of human casualties and property damage. Underground workers who were as we have seen at great risk, were not employees in the same sense that factory workers were. The miner contracted to extract clean coal from the operator's mine at so much per ton; and out of his fee he paid his laborers and purchased and owned the necessary tools, oil, lamps, gunpowder, squibs, and other equipment and supplies. He worked virtually without supervision, beyond warnings from the fire boss at the start of the day about possible gas or loose roof in his workplace.¹⁵ And if he was killed or injured, it was his own fault not the colliery operator's. Thus, while there was constant public awareness that many miners were killed and injured (the *Pottsville Miner's Journal* reported at least a third to one half of all actual accidents in its pages), the colliery operator was almost never held responsible. Gas explosions were regularly blamed on a reckless miner rather than an inadequate ventilation system. To have held the operator responsible in the event of human casualty would, of course, have entailed on him additional expense for safety and would have called into question the operator's competence and the adequacy of the design of the mine.

A third constraint was a booster mentality. To express less than complete assurance about the safeness and adequacy of prevailing mining technology, to suggest that collieries were dangerous enterprises prone to failure as a result of disaster, appeared to entrepreneurs like Enoch McGinness to be a kind of treason. Men who would do this were "croakers" and a burden to the coal trade because they reduced the confidence of lenders, made insurance companies wary, and might prompt legislators to pass unfriendly laws (such as a mine safety

act or a charter to a wealthy, and aggressively competitive, coal and iron corporation). There was a risk then in even mentioning disaster as an economic hazard in mining anthracite. It is perhaps symptomatic of this attitude that the experienced mine administrator John Maguire, in his autobiography, recalled the sad deaths by asphyxiation underground of three mine officials in 1880, as a result of their carelessness in opening a door, but failed to mention that the noxious gases behind the door were generated by an underground fire that burned for two years and cost the Thomas Coal Company \$125,000 to extinguish.¹⁶

Such attitudes as these must have influenced the economic decision matrix for prospective colliery operators in the early years. The likelihood of an explosion-fire-and-flood catastrophe was probably rated as lower than other, purely financial causes of colliery failure (unfortunately, direct statements of subjective probabilities are so far lacking in the data). To be sure, McGinness was intellectually aware of the need for a second shaft and wrote to his sponsor, Henry Carey, "there must be a shaft sunk . . . for properly ventilating my workings, and should be done soon." But no second shaft was sunk.¹⁷ Meanwhile, the prospects of financial gain were enormously inflated. In October 1854 at a testimonial dinner in his honor, Enoch McGinness announced that he expected to ship 1,000 tons of coal per day from the St. Clair Shaft; one of the speakers declared that this one shaft had "absolutely opened many hundreds of millions of tons of coal—an amount . . . quite sufficient to supply the markets of the civilized globe for many years to come!"¹⁸ Early in June 1855 the shaft was beginning to pay and McGinness was anticipating a steady profit of about \$6,000 per month on 12,000 tons of coal. He thus assumed an unreasonably high profit of 50¢ per ton (the best mines averaged about 10¢ per ton) and he also assumed a production level double

what was ever achieved. But in the middle of June, an explosion killed one man and injured another, setting in motion a train of production difficulties that resulted in his abandoning the business five months later. As he lamented to Carey, one year after the testimonial dinner, "I and my family may starve."¹⁹ But within a couple of years, he was again sinking more shafts and slopes about St. Clair for Carey. One of the slopes exploded, burned, and was flooded in 1860 and again McGinness lost his colliery. This time the reason for the explosion was that he had failed to drive any air hole at all to ventilate the workings in a new mine. There was thus neither an upcast nor a downcast, just a hole in the ground. As he told Carey, he was opening up the mine "as fast as possible." After the explosion, he planned to pay for driving up the air hole, which he estimated would cost \$400, by selling coal from the same unventilated mine!²⁰

McGinness, as he reveals himself in his correspondence and public statements, seems to have inflated reasonable estimates of possible gain by a factor of about ten. And, imbued by the "industrialist as hero" motif, he aspired to be one of the "daring men . . . not mere money getters" who would make Schuylkill County the energy center of the world.²¹ Thus, even though he suffered chronic problems of cash flow, he saw himself always on the verge of achieving fame and making a "very handsome fortune." In this context, the most imminent

and pressing danger was a lack of confidence in him by his creditors (particularly Carey and Carey's partners). The risk that preoccupied him was not a mine explosion or fire or flood but loss of credit, even though he knew from experience that the mines he was sinking were highly vulnerable to disaster.

Some of the participants in the anthracite drama could express doubts about their own economic rationality, however. Benjamin Franklin Gowen, earlier a failed colliery operator now president of the Philadelphia and Reading Coal Iron Company and a member of the American Philosophical Society, expressed this view in a famous statement before a Pennsylvania legislative committee in 1875: "Three men retired from the business of coal mining with money . . . one of those died in an insane asylum and another had softening of the brain."²² But perhaps we should let the miners themselves have the last word. It is perhaps this kind of self-delusion by their "sensible" employers that was celebrated in a famous local miners ballad, entitled "The Driver Boys of Wadesville Shaft." After a series of accounts of driver boys taking outrageous chances in the mine, one of the concluding stanzas declares:

In insane asylums madmen rave,
But where sensible men go daft,
You'd go nutty too with that bughouse crew,
On the bottom of Wadesville shaft.²³

NOTES

1. John U. Nef's classic study, *The Rise of the British Coal Industry* (London: Routledge, 1932) deals almost exclusively with the sixteenth and seventeenth centuries. Information on eighteenth and nineteenth century British mining practice may be found in Robert L. Galloway, *A History of Coal Mining in Great Britain* (London: Macmillan, 1882) and Mining Association of Great Britain, *Historical Review of Coal Mining* (London: Fleetway Press, 1957).
2. "European Correspondence: Letter No. 23," *Pottsville Miners' Journal*, 13 December 1856.
3. See Galloway's account of the South Shields Committee which in 1843 published a report condemning single shaft mines and recommending an Act of Parliament to ban them. Such an act was eventually passed in 1862 after the Hartwell Colliery disaster. Galloway, *History of Coal*, 228, 245.
4. John Holland, *The History and Description of Fossil Fuel, the Collieries, and Coal Trade of Great Britain* (London: Whittaker, 1835); John Hedley, *A Practical Treatise on the Working and Ventilation of Coal Mines* (London: Weale, 1851).
5. Identification of the *Miners' Journal's* correspon-

- dent as William Jackson Palmer is made in J. S. Fisher, *A Builder of the West, the Life of William Jackson Palmer* (Caldwell, Idaho, 1939).
6. Descriptions of the St. Clair Shaft as it was when first sunk in 1854 may be found in McGinness's letters to Henry Carey in the Carey-Gardiner Collection, Historical Society of Pennsylvania (Philadelphia), and in Ele Bowen, *The McGinness Theory of the Schuylkill Coal Formation* (Pottsville, Bannan, 1855).
 7. The circumstances of the 1856 fire were described in a letter from Andrew Russell, Carey's business agent, to Henry Carey, 8 August 1856 (Carey-Gardiner Collection, Historical Society of Pennsylvania).
 8. The history of the St. Clair Shaft after 1856 has been collated from a number of sources including Carey's business correspondence with McGinness and Russell, Carey's public *Letter . . . to the St. Clair Coal Company of Boston* (Philadelphia: Collins, 1865), and descriptions in the annual *Reports of the Inspectors of Coal Mines of Pennsylvania* for 1869–1874.
 9. The Avondale disaster received much attention from the national press. Detailed, illustrated accounts were provided, for instance, in *Harper's Weekly* for 11 September 1869 and *Frank Leslie's Illustrated Newspaper* for 25 September 1869. The mine safety act requiring "two outlets to each coal seam" is Act No. 1 of the *Laws of Pennsylvania of the Session of 1870*.
 10. As late as 1883 the geologist Henry M. Chance, in the most authoritative report on mining technology published in Pennsylvania to that date, expressed doubt as to the spontaneous combustion of anthracite. See Henry M. Chance, *Report on the Mining Methods and Appliances Used in the Anthracite Coal Fields* (Harrisburg: Second Geological Survey of Pennsylvania, 1883), 417–418.
 11. McGinness complained that after an explosion or fire his workers either slowed down production or demanded higher pay. McGinness to Carey, 14 July 1855, 17 August 1855, concerning a slowdown at the shaft after a fatal explosion, and 8 August 1861, concerning the payment of "high wages" after men were injured.
 12. Not included in this account is the Pottsville Twin Shafts, sunk by the Philadelphia and Reading Coal and Iron Company in the 1870s at a site about a mile south of St. Clair. This mine was over 1,500 feet deep and never actually got into production because of continuous technical difficulties.
 13. The financial problems of the Schuylkill operators have been analyzed in detail in Clifton K. Yearley, *Enterprise and Anthracite: Economics and Democracy in Schuylkill County, 1820–1875* (Baltimore: Johns Hopkins, 1961) and in Stuart Campbell, "Businessmen and Anthracite: Aspects of Change in the Late Nineteenth Century Anthracite Industry," (University of Delaware doctoral dissertation, 1978).
 14. U.S. House of Representatives, 50th Congress, *Labor Troubles in the Anthracite Regions of Pennsylvania 1887–1888* (Washington: Government Printing Office, 1889), 623.
 15. The contract miner system has been carefully described in Harold W. Aurand, "The Anthracite Miner: An Occupational Analysis," *Pennsylvania Magazine of History and Biography*, 104 (1980): 462–473.
 16. "Reminiscences of John Maguire after Fifty Years of Mining," *Publications of the Historical Society of Schuylkill County*, 4 (1912): 305–336, pp. 327–328. The efforts to put out the fire were described at length in the *Annual Reports of the Mine Inspectors* for 1880 and 1881.
 17. McGinness to Carey (Carey-Gardiner Collection, HSP), 27 February 1855.
 18. Bowen, *McGinness Theory*, 10, 17.
 19. McGinness to Carey, 24 October 1855.
 20. McGinness to Carey, 6 January, 21 July, and 27 July 1860.
 21. McGinness to Carey, 29 August 1861. See Anthony F. C. Wallace, *The Social Context of Innovation* (Princeton: Princeton University Press, 1982) for a discussion of the industrialist-as-hero theme in the nineteenth century.
 22. Yearley, *Enterprise and Anthracite*, p. 65.
 23. George Korson, *Minstrels of the Mine Patch: Songs and Stories of the Anthracite Industry* (Philadelphia: University of Pennsylvania Press, 1938), 122.

The Inca Coca Monopoly: Fact or Legal Fiction?

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Since the late fifteenth century when the Spanish first encountered Indians chewing the leaves of a plant frequently described as similar to sumac, the *Erythroxylon coca* plant, popularly known as coca, has been the center of controversy. During the early colonial period, debate broke out in Peru between two factions: the clergy and the colonial bureaucracy, who urged that use of the "Devil's leaf" be prohibited as an impediment to the Christianization of the natives, and others who recognized the vital importance of coca's role in the Peruvian economy and lobbied in its defense. The coca lobbies won. Thus, coca survived as a major ingredient of Andean culture and as a keystone of the economies of Peru and Bolivia.

In the second half of the twentieth century, with a growing demand in the United States and other nations for illicit cocaine, an alkaloid extracted from the coca leaf, controversy has resumed. The United States government and several international organizations that oppose the international drug trade have undertaken a campaign to pressure Bolivia and Peru to eradicate cultivation of coca within their borders. For the past several years, the major focus of the

effort was in the development of appropriate crops that could be substituted for coca. Recently, however, "improved herbicide eradication techniques" are being employed in Peru, where the government has cooperated closely and where the United States State Department sees "... real possibilities for success in effectively diminishing illicit Peruvian production." In Bolivia, where a military junta that supposedly has close connections with the major cocaine traffickers took power in July 1980, the spraying of herbicides on coca plantations has never been permitted and even the crop substitution program has been halted. Nevertheless, the United States government has not given up entirely and plans to seek renewed Bolivian cooperation should the political situation change significantly in the future.¹

While most opposition to coca comes from the United States, some modern prohibitionists are Marxists, whose objections spring from a Calvinistic-like puritanism based on the unfounded supposition that coca is a stupefying narcotic, which is manipulated by the ruling classes to repress and exploit the Indian masses.²

Many of those who advocate the eradication of coca leaf have given little thought to the fundamental role the leaf plays in nearly every aspect of native Andean culture and that it is legally chewed by millions of people on a daily basis. Prohibitionists often attempt to explain away concerns about the potential social harm of programs of eradication, or "rationalization," of coca

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production with the argument that coca is not necessary to the Indians because they did not have access to it during the Inca period. This refers to the traditional interpretation that the Incas established a state monopoly over coca cultivation and restricted its consumption to the elite. Recent research, however, has produced information that brings this monopoly theory into question. Thus a reexamination of the Inca coca monopoly in the light of this new information in an effort to determine if it ever really existed is in order. This question seems worthy of the most careful consideration given the vital political importance imparted to it by the present-day coca debate.

COCA LEAF IN PREHISTORIC PERU

In prehistoric times, cultivation of the coca plant and the use of its leaf extended throughout much of America, from Argentina to Nicaragua and the Caribbean Islands, where it was first noticed by the Spanish on the island of Hispaniola in the last decade of the fifteenth century. The use of coca leaf in northern South America was first reported in 1499 by Tomás Ortiz, a Dominican missionary, among the Indians of the Venezuelan coast, where it was an important trade item. Early use of coca was also reported by Amerigo Vespucci at the mouth of the Rio Para in Brazil. While the chronicles of Francisco Pizarro's expedition to Peru make no reference to coca (not surprising since the Spanish were already familiar with the habit among the Indians of the Caribbean basin and were probably preoccupied with military aspects of the campaign) the leaf had been masticated there for centuries before the Incas established their hegemony over the Central Andean region.³

The exact time and place of coca's domestication are unknown. Most likely the plant was native to the Amazon basin. By 1500 B.C. it was known along the south-central Peruvian coast, where the leaves and

paraphernalia associated with their mastication have been found in tombs at the Asia 1 site, which is usually dated 2500 to 1500 B.C.⁴ In the highlands, where the climate is not so well-suited to the preservation of vegetable matter as that of the dry coastal desert, the archaeological record is rather poor. Still, gold and ceramic artifacts were discovered at Tiwanaku (Bolivia) depicting human subjects with the tell-tale bulge in the cheek associated with coca chewing, indicating that the leaf was in use there perhaps as early as the fourth century A.D.⁵ If so, this dates the beginnings of the Bolivian coca industry at least a thousand years before the Inca conquest of the Collao*, thereby belying the traditional interpretation that coca cultivation and use were first introduced to the region by the Inca Huayna Capac in the fifteenth century A.D.⁶ The claim that the coca trade from the Yungas valleys of the eastern escarpment of the Andes to the highland plateau was already flourishing by the fourth period (A.D. 375-715) of Tiwanaku, lacks any supporting evidence.⁷

Additional evidence to support the theory that the peoples of the Collao domesticated coca themselves rather than importing it from Cuzco comes from the term "coca," by which the leaf is known throughout the Andes from Argentina to Ecuador and parts of Colombia, evidently derives from the Aymara word *Khoka*, the generic term for 'tree' or 'bush'.⁸ Furthermore, the Aymaras have a legend relating the origin of coca, which they probably would not have if they had received the plant from the invading Incas. According to this legend, the inhabitants of the Yungas burned off the forests to prepare for planting their crops, and the smoke covered the snow-capped peaks of Illimani and Mururata, particular favorites of the gods. Seeing this, the god Khunu became so angry that he unleashed torren-

*A region of the high plateau surrounding Lake Titicaca inhabited by Aymara people before the expansion of the Inca Empire into what is now southern Peru and Bolivia.

tial rains, which destroyed the homes and fields of the Yungas people and cut off communications with the highlands, forcing the people to wander the forests in search of food. Exhausted by hunger and fatigue, they chanced upon a beautiful shrub whose luxuriant leaves were so enticing that they picked some and began chewing them only to discover that they immediately recovered their lost vigor. This marvelous shrub was, of course, the coca plant.⁹

This legend notwithstanding, the Collas were not necessarily the first or only group to discover the plant. Coca could have been domesticated in several places by different peoples independently of one another, as the existence of various legends suggests. One such legend was recorded in the Cuzco region by the Spanish in 1571, when Viceroy Francisco de Toledo ordered information gathered on the religion and customs of the Incas. The Quechua legend was related by three witnesses as follows:

Among the natives it was told that the said coca, before it became a tree as it now is, was a very beautiful woman, and because she was evil in her body they killed her and cut her in half and buried her, and from her was born a tree, which they called macoca and coca mama, and since then they began to eat [sic] it, and it was said that they carried it in a bag that they could not open to eat it except after having copulated with a woman in memory of that other, and that there had been and are many *pallas* [harvests], for this reason they called it coca.¹⁰

Although no one doubts today that coca was used in Peru long before the creation of the Inca Empire, the exact nature and extent of its use remains unclear. Joseph Gagliano claims that among some pre-Inca ethnic groups coca chewing was reserved for the elite, but he admits that even in these cases it was permitted to the warriors.¹¹ Other groups may not have restricted coca use solely to the ruling classes. One such group inhabited the Cavernas site near Paracas on Peru's southern coast as early as the fourth century B.C. Coca leaf was found in tombs at Cavernas where little archaeolog-

ical evidence was found suggesting the existence of sharp class distinctions.¹²

Some chroniclers and early historians of colonial Peru asserted that the Incas, retaining these earlier restrictions, prohibited coca chewing among the common people, reserving it strictly for the nobility and the uses of the religious cult. Some even suggest that the cultivation of coca developed into a state monopoly.¹³ One of the earliest writers to mention Inca prohibitionism was Juan de Matienzo, a justice of the Audiencia de Charcas, who in 1567 informed the king of Spain that:

This prized herb that we call coca was used and harvested in the whole region of the Andes, and it was a delicacy [*manjar*] of the lords and chiefs and not for the common people, except when they wanted to make them a gift, although in war [the commoners] ordinarily use it (according to all the old people, who also say that after the Incas subdued the kingdom and put it under their domination, they made the foreigners establish plantations of coca, each in his region, and dedicated them to the Inca and for the sacred places [*huacas*] and temples, even though all of these were, and were worked, in the name of the Inca).

All the provinces which he had charged with working these [plantations] delivered the produce to him, and he distributed it and gave it to those who looked after the mummies of the Incas, and to the Sun, and to whomever he wished.¹⁴

Additional evidence supporting the Inca coca monopoly was obtained in 1571 when Viceroy Toledo's investigators questioned a large number of old men about Inca customs. These then resided in the Cuzco area even though they were originally from various parts of the realm. In response to a question about coca use in the Inca Empire, they invariably replied that consumption of the leaf was restricted to the Inca and those to whom he granted the privilege, and all *cocales* (coca plantations) belonged to the sovereign. A typical response was as follows:

at the time of the said Guaynacapal [sic], the coca that existed was only from plantations for the said Inca and there were no other plantations neither of chiefs nor other Indians, and that these plantations of the said Inca were in hot valleys. These were small plantations, which they had given out to have cultivated. The said coca was eaten only by him and whomever he wished to give it as a gift, which was to the chiefs that were with him and to his favorites . . . and the said chiefs greatly valued it as something that was not allowed to the rest of the people except those whom the Inca permitted, and the rest of the common people did not have it nor obtain it.¹⁵

At first glance this document seems to offer irrefutable evidence of an Inca state coca monopoly. More careful analysis, however, reveals problems with such a conclusion. First, most of the witnesses, even those originally from other areas, were long-time residents of the Cuzco area and had not had direct contact with the outlying regions of the empire for many years. Second, their testimony was recorded in the midst of a great coca debate between certain religious forces who called for the prohibition of coca chewing among the Indians because of the leaf's association with the native religion, and economic interest groups who argued that coca was the key to the entire colonial economy of Peru since the Indians would not work either in the mines or the fields without it.¹⁶ Viceroy Toledo stood with the prohibitionist forces seeking information to counter the coca lobby's argument that the leaf was a virtual necessity to people subjected to heavy physical labor at high altitude. The Indians were notorious for telling the Spaniards what they wanted to hear and in these interrogations both questions and answers were standardized. Thus the phrasing of questions would often elicit a specifically desired response—an unsound practice for getting at the truth—but an excellent means of obtaining justification for a preconceived opinion. Toledo's question was whether they knew that in the time of the Incas "*coca was not used except by the Inca*

and a few to whom he gave it, such as caciques (chiefs) or some favorite of his," thus excluding everyone else.¹⁷ After considering these problems inherent in the Toledo document, one must be skeptical of its contents.

Yet, solely on the basis of evidence such as that offered by the chronicles and Toledo inquiries, historians have developed an "Inca monopoly theory," which has obtained almost general acceptance, arguing that the Spanish conquerors encouraged popularization of this habit so as to control the indigenous population and to compel them to work in the mines. As a result coca use by Andean peoples has become part of the "Black Legend" of the Spanish Conquest of Peru.¹⁸ More careful study, however, reveals problems with the monopoly theory.

The bias of early viceregal investigations is not the only weakness in the evidence supporting the theory of Inca prohibitionism. Others exist, especially in the information provided by the chronicles. The chroniclers are known to have copied from each other, frequently erred when attempting to explain aspects of culture which they did not fully understand, contradicted themselves on many points, and sometimes deliberately falsified information. An example of the frequent self-contradictions appears in Matienzo's work. He claimed that coca chewing was restricted to the nobility, but he pointed out that the Inca granted the privilege to anyone he wished and that commoners could use coca when permission was granted in this fashion.¹⁹ Father José de Acosta, writing in the mid-sixteenth century, and Father Bernabé Cobo, who copied Acosta on coca in the seventeenth century, also asserted that mastication of coca was generally prohibited, but that permission for plebian use could be granted by either the Inca or his provincial governors.²⁰

Not surprisingly, the same ambiguities appear in works of modern historians, who depend upon the chronicles for their information. One of the major studies on coca

leaf indicates that the Incas were disinterested in coca until their expansion during the reign of Inca Roca (ca. A.D. 1250–1315) brought them into contact with coca-chewing Indians inhabiting the eastern escarpment of the Andes Mountains from where it was introduced into the empire. As expansion continued through the fourteenth century, the Incas gradually assumed "virtual control" over the leaf's cultivation until, in the fifteenth century, the coca plantations were converted into a state monopoly with labor provided by the *mita* (literally "turn") system, and the entire harvest delivered to Cuzco. Although this study claims that the Incas restricted coca chewing to the elite and that as the plant assumed a "sacrosanct aura" in the fifteenth century, indiscriminate chewing became a sacrilege, it affirms that the expanding Incas apparently did not rigidly enforce any existing restrictions on indiscriminate chewing of the leaf. Soldiers continued to use it as did workers on public projects and traders while traveling. The Inca also gave the leaf to *curacas* [chiefs] as a symbol of political authority. Finally, Gagliano tells us that in the second half of the fifteenth century, as Inca power declined during the civil wars, restrictions on coca use were relaxed somewhat but the masses were still denied the privilege of mastication. Moreover, Huascar (A.D. 1493–1527) extended the privilege of cultivating coca to many newly-created nobles, thus ending the Inca monopoly.²¹

A more recent student of coca among the Incas claims that coca use began to spread during the empire's waning days when serious food shortages occurred. Arguing that there is a direct relationship between "hypoproteinemia and cocaism," he cites Father Las Casas, maintaining that Tupac Inca, son of Pachacutec, relaxed the prohibitions and ordered the people to consume coca. Thus, when the Spanish invaded Peru, they found the Indians "devoted to the vice of the *coqueo*."²²

In addition to ambiguities resulting from

dependence upon the chronicles and other published sources, one must not overestimate the accuracy of Inca chronology. While some early writers insisted that the Inca empire was very old, others argued that the Cuzqueños began to expand beyond the immediate area of the capital city only in the fifteenth century. The second position is supported by a 1561 document that concluded that the Incas had not long dominated Peru because the old people could remember when they conquered most of that territory.²³

Many leading scholars accept the interpretation that Inca expansion got underway during the reign of Pachacutec Inca (A.D. 1438–1463) with the conquest of the Collao region around Lake Titicaca about 1445. The remainder of Bolivia was conquered by Tupac Inca Yupanqui and Huayna Capac after 1470 so that the Collasuyo quadrant had been part of the empire for less than a century when the Spanish arrived in 1532.²⁴ If this is true, then the *cocales* of that region certainly would not have been subject to Inca prohibitionism and monopoly in the fourteenth and early fifteenth centuries.

It also seems that the Aymara people of the Collao region remained hostile to the Incas and frequently rebelled, so that the Inca presence was essentially military as reflected by the existence of a number of fortified citadels totally lacking in monumental architecture.²⁵ Further evidence of Colla resistance to Inca domination can be found in the survival of the Aymara language despite attempts to impose the imperial Quechua. Thus, it would probably have been difficult for the Incas to impose restrictions on coca cultivation and use on a hostile population. One should also be careful of claims that the Inca Empire was on the wane in the early sixteenth century because of the civil wars arising from disputes over dynastic succession. Other empires survived numerous civil wars, so it is quite possible that the Incas would have continued to develop theirs had not Francisco Pizarro arrived.

CONTRADICTORY EVIDENCE

As ethnohistorical research progresses, more reliable evidence is being uncovered that increasingly challenges the "Inca monopoly theory." The 1567 *visita* (census) of the province of Chucuito reveals that the Colla "kingdoms" of the Lake Titicaca area had colonies located in the Yungas regions of Larecaja and La Paz providing them with coca before the Incas conquered the region. One of these colonies was at a place called Chicaloma some 60 leagues from Chucuito. Although the precise location of the colony is unknown, Chicaloma was the name applied to Coripata, one of the major coca-producing regions of the Yungas of La Paz, until the eighteenth century. It is worth noting that the Chicaloma colonists who grew the coca were permitted to keep half of the harvest for their own use.²⁶

These Aymara coca colonies formed part of an "archipelago" system established by highland communities throughout the Andes to provide access to various ecological zones located at different altitudes. The Incas expanded this ancient arrangement of production through the creation of new colonies, or *mitmaquna*, so that the Colla continued to have access to their own cocalas after they were absorbed into the Tawantinsuyu.²⁷ An early defender of the native Peruvians, Father Luis de Morales, wrote in 1541 that throughout Peru, but especially in the Collasuyo where highland communities could grow only potatoes and quinoa, the Inca Huayna Capac sent whole families from each community into the Yungas valleys as *mitimaes* (*mitmaquna*) to grow coca, corn, *ají* (peppers), and other vegetables that were lacking in these communities.²⁸ Pedro de Cieza de León, one of the more reliable of the early chroniclers, confirmed this, adding that the Inca state strongly encouraged these colonies. They even received supplies from state storehouses until they could harvest their own crops and they were granted exemption from tribute for a few years.

Consequently these *mitimaes* eventually became so productive that shortages of coca, or any other crops, rarely occurred in highland communities, all of which benefited from their existence.²⁹

In territory of modern-day Bolivia, the Incas resettled *mitimaes* in the coca-producing valleys of the cordillera from La Paz to Cochabamba, where newcomers joined colonies belonging to local altiplano communities. In Pocona, the *visita* of 1557 revealed that the population included *mitimaes* from various regions as well as groups moved out of the Cochabamba valley to make room for state *mitimaes* established there by the Incas.³⁰ The Charcas coca regions presented an interesting patchwork of state and local *mitimaes*. Aymaras and Quechuas existing side by side in apparent harmony. The Incas perfected the road system into Yungas to facilitate the transport of coca to the highlands. Two such roads passed through the valley of Chuguiabo, where the city of La Paz now stands.³¹

This ancient "archipelago" arrangement was widespread in the Inca empire. The inhabitants of the Jauja valley had colonies growing coca and *ají*, while several highland communities had cocalas on the banks of the Humanamayu near Cajamarquilla.³² Groups residing in the Huanuco area before the time of the Inca also had their own cocalas in nearby valleys, which they exploited for their own use.³³ Finally, when the Incas conquered the Huancayo region around A.D. 1460, they "confirmed" possession of the cocalas already established by the Huanca communities so that no outsiders could have access to them. In one instance the Inca gave a cocal to two *ayllus* of the community (*guaranga*) of Guarani, which had lacked their own source of coca leaf prior to the Inca conquest. In the 1571 *visita*, the Huancas declared that these coca lands had always belonged to the communities rather than to the Inca state.³⁴

The system of *mitimaes* carried over into the early Spanish period, although it quickly

began to fall apart as the Spanish indiscriminately divided the territory into *encomiendas* without regard to the pre-existing agrarian order. Thus, some *encomiendas* included *mitimaes* of highland communities belonging to another *encomendero*, which meant that these communities were cut off from their supplies of coca, corn, ají, and other Yungas commodities. This led some early defenders of Indians to call for the return of these *mitimaes* to the jurisdiction of their home communities.³⁵

Such petitions may have had some results because evidence indicates that some highland communities held onto their Yungas *mitimaes* well into the early colonial period. In his 1548 report on the state of the *repartimientos* (a group of Indians owing tribute, labor, or other service to a Spanish overlord) of Charcas, Gabriel de Rojas indicated that 18 of the region's 44 *repartimientos* were paying coca as tribute. Of these 18, 12 had their own *cocales*. A number of these *repartimientos* consisted of highland communities with colonies in the Yungas; for example, the *repartimiento* of Sacaca in northern Potosí had coca lands in the Yungas of Totorá southeast of Cochabamba. The 18 coca *repartimientos* were assessed a total of 17,190 *cestos* (bales weighing about twenty five pounds) in tribute each year. Pocona, a *repartimiento* in the Yungas of Cochabamba, was assessed 6,000 *cestos* in 1548, but had previously paid as many as 12,000. Such reductions in the number of *cestos* paid in tribute were frequently noted and blamed on declining production. Rojas attributed the drop in Pocona valley production to the flight of many people from the area, but another cause he noted was that the *cocales* were old and needed replanting.³⁶

If the Incas had truly monopolized coca production, it is unlikely that this situation could have existed as early as 1548. The total tribute paid in coca amounted to about 447,500 pounds per year. Thus, total production was quite large, for the tribute rep-

resented only a fraction of total production. Yet this was only 13 years after the Spanish first invaded Charcas. The region's first Spanish urban center, the Villa de la Plata (Sucre), was founded in 1538, while La Paz was not established until 1548. Of some interest is the fact that Rojas's report, written the same year as the founding of La Paz, claims that coca production was declining because many *cocales* were so old that they no longer yielded large harvests. Coca plants require about three years to reach full production levels and then produce for some 20 to 40 years, with declining yields in the later years.³⁷ Because many *cocales* needed replanting in 1548, they were obviously of pre-hispanic origin.

Coca-producing *mitimaes* belonging to highland communities survived into the second half of the sixteenth century. During the period 1558–1564, the highland *repartimientos* of Calamarca, Laja, Guacho (Guaqui?), Ayacha (Aigachi?), and Paucarcolla (near Puno) had *mitimaes* growing coca in the Yungas of La Paz.³⁸ A 1568 visita of the important coca-producing region of Zongo near La Paz mentioned *mitimaes* that had been established there by the Incas. These groups paid no tribute to the *encomendero* of Zongo, but rather were subject to the *caciques* of their communities of origin, that is, Jatuncolla, Arapalla, Arapata, and Lampa.³⁹ As pointed out above, the communities of the Huancayo region still had their *mitimaes* in nearby coca-producing regions in 1571. Possibly some highland communities controlled their *mitimaes* into the seventeenth century.

LAND TENURE AND TRIBUTE

A major aspect of the Inca coca monopoly theory is the claim that the *cocales* were the exclusive property of the Inca and the coca harvested from them was his alone. A close examination of land tenure and tribute patterns indicates that this was not entirely true. The visita of Zongo (1568) reveals that

the people of that area possessed *cocales* at least since Inca times. John Murra, a leading student of the Inca economy, believes that these *cocales* belonged to the Inca state.⁴⁰ Nevertheless, close examination of the *visita* reveals that coca production was by no means limited to fields set aside for the Inca, which were specifically pointed out by the *caciques*. Clearly the other *chacras* (fields) belonged either to the local communities or to individuals, both *caciques* and peasants.⁴¹

The Zongo land tenure system, consisting of privately-owned, communally-owned, and state-owned *cocales*, was very similar to the pattern described in the *visita* of Huancayo (1571) where the Incas, upon conquering the region in the fifteenth century, permitted individual peasants and communities to continue in possession of their *cocales* while some parcels were assigned to the Inca and the Sun. It should be noted, however, that individual ownership was not universal throughout the Huanca territory. Although every family in the *guaranga* (a unit of 1,000 people) of Guarauni possessed a *cocal*, only a few households in those of Huancayo and Maca owned *chacras*. Significantly though, the Huanca affirmed that these individually-owned lands were held in perpetuity and were passed on as inheritance from father to son both in the Inca and the colonial periods.⁴² While the Zongo *visita* devulges no details on inheritance practices, the two documents clearly demonstrate the existence of peasant-owned *cocales* in widely separated regions of the Inca Empire.

Jurgen Golte also found several forms of tenancy existing simultaneously in the coca *chacras* of different regions. Some lands were assigned to peasant families, others to an *ayllu*, or perhaps several *ayllus*, some to the Sun and local *huacas* and, of course, some to the Inca.⁴³ The Inca lands were segments of community-owned properties used for a variety of tax purposes including local public expenditures, rather than family lands

which descended in the various Inca lineages.⁴⁴

Unfortunately, no sources provided specific data on the relative amounts of land assigned to individuals, communities, *huacas*, or the state, although the *visitas* of Zongo and Huancayo give the impression that the Inca lands were smallest by far. This idea coincides with the conclusion of Sally Falk Moore's excellent study of the relationship between power and property in the Inca Empire. While admitting that the relative amounts could vary from one region to another, depending upon productivity and the relationship of the local authorities to the conquering Incas, she demonstrates that, in the Chincha valley of Peru, Inca lands were less than one percent of the land cultivated by local people for themselves. She also deduces from reports that the storehouses for the harvests from Inca lands were much larger than those of the Sun that the lands assigned to the Sun were even less extensive.⁴⁵

How is it then that the chroniclers have given us a different picture? Possibly they were often ignorant of native customs and misunderstood the land tenure system, or perhaps confused ideal patterns with reality. The Indians of the northern Potosi repartimiento of Sacaca, who had coca lands in the Yungas of Totorá, reportedly informed the Spanish in 1579 that these *cocales* had belonged to the Inca, but that he gave the land to them.⁴⁶ This may have meant that the Inca had claimed *cocales* Sacaca already possessed and confirmed them as in the case of Huancayo, or that a *Sacaca mitimae* was created by the Inca like the ones at Pocona and other places already mentioned. Another possibility is that they may have deliberately fabricated the monopoly theory to defend the Spanish king's right to claim those lands for himself and to commend them in turn to conquerors who had served him well.⁴⁷ One sixteenth-century chronicler, Juan Polo de Onde-

gardo, practically admits as much in the following discussion of *encomiendas*:

if the royal patrimony is inherited by His Majesty and these *encomiendas* that he grants for one life or several lives, as he sees fit, it is clear that it is not his intent, nor is it just, that he commend the property of the Indians, but that which belongs to him; and that tribute must be from that which the Inca received as king and lord, and not that of the common or that belonging to anyone, from which resulted a notable mistake, and it was that they informed His Majesty that all the coca *chacras* belonged to the Inca, and they spoke the truth; and for the same reason they belonged to him and the result was not bad, and thus a royal order was issued about it and the public attorney took up the matter . . . and thus it ended with only one principle, that just as they belonged to the Inca and belong to His Majesty, he could commend them as he had done and when the time expired he could reclaim them for himself if he wished, or commend them again.⁴⁸

Although Polo de Ondegardo's discussion is a bit convoluted, it suggests that the colonial authorities were making a conscious effort to prove that all coca *chacras* had been the personal property of the Inca, to the end that the Crown should either claim them for itself or grant them in *encomienda* to favored subjects. One has to ask, then, to what extent the chroniclers, some of whom were royal officials, were enlisted in the defense of the official position.

Just as ignorance of the land tenure system apparently led to confusion about ownership of the *cocales*, so might the Iberian concept of tribute have caused misunderstanding about the distribution of coca in the Inca Empire. In Europe, tribute was understood as money or commodities paid to an overlord. Therefore chroniclers and Spanish colonial officials usually viewed Inca tributes in similar terms.⁴⁹ According to a document dating probably from the period 1570–1575, tribute, at the time of Topa Inca Yupanqui, was collected from the tribes of the Andesuyu in the form of feathers, monkeys, *ají*, coca, and palmwood

darts.⁵⁰ Other early observers discerned that the Inca concept of tribute was somewhat different, being imposed on the entire community rather than individuals and consisting only of their labor.⁵¹ John Murra agrees that tribute was paid to local lords and to the Inca himself only in the form of labor.⁵² Nevertheless, as Falk Moore pointed out, from the practical point of view of the peasant agriculturalist, what he gave was service, while from the standpoint of the state, what was received was produce.⁵³

It should be pointed out the lands belonging to the communities were their common property and were divided up annually among the adult males according to their needs and the size of their families. Each family worked its assigned plots alone, or with the help of others in the traditional Andean reciprocal-labor pattern. The harvest from these lands was theirs to keep and they bore no obligation to pay tribute from it.⁵⁴

The details of the Inca tribute system are not yet clear and evidently differed from region to region. It is generally believed that only adult males were subject to tribute levies, but age groupings varied. The *caciques* of Zongo claimed that only males between the ages of 20 and 40 paid tribute, but other sources indicate that while 16 to 20 year-old youths did not pay tribute, they helped harvest coca for both the Inca and the local *curacas*, which under the labor theory of taxation was the same as paying tribute.⁵⁵ Likewise unmarried Huanca girls paid tribute by helping harvest the Inca's *cocales*.⁵⁶

Another point of controversy concerns what was done with coca and other produce harvested from Inca lands. Some early chroniclers claim that all of this coca went to Cuzco for the Inca.⁵⁷ One of Pizarro's soldiers, Diego de Trujillo, reported seeing large stores of coca and other goods at Cuzco.⁵⁸ Nevertheless considerable evidence contradicts the idea that all coca harvested in the empire was sent to the capital.

The people of Zongo, Challana, and Chacapa reported that they had paid tribute once a year to the Inca from coca harvested on his lands. They pointed out, however, that they did not have to pay tribute to the Sun god or to any other gods or huacas. The community of Chacapa paid two *guaycayas* (a *guaycaya* equaled $2\frac{1}{2}$ *cestos*) of coca, plus ten *pacos* (a *paco* equaled $1\frac{1}{2}$ *cestos*) of coca, and twenty *malto*s (a *malto* equaled one *cesto*) of coca, for a total of 40 *cestos* of coca per year in tributes to the Inca. Similarly, the *caciques* of Challana declared that they had paid twenty *guanacos* (each *guanaco* equaled three *cestos*), 20 *pacos*, and 40 *malto*s of coca to the Inca each year, for a total annual tribute of 130 *cestos* of coca. Finally, the *caciques* of Zongo claimed they had paid the equivalent of 45 *cestos* of coca per year to the Inca. Thus, the communities of the entire repartimiento had paid an annual tribute of 215 *cestos* of coca to the Inca. This coca was not taken to Cuzco, however, but was deposited in several warehouses located in the surrounding area.⁵⁹

The Huancas, like the people of Zongo, paid tribute in coca, but unlike Zongo, they also paid other things. Each year the nine *pachacas* (units of 100 people) of Huancayo paid 45 large *cestos* and 45 hampers (*petaquillas*) of coca to the Inca. They also worked a small *cocal* for the Sun, the harvest from which was burned as an offering to that important deity. In addition, the Huancas worked the *chacras* of their principal *curaca*, including a *cocal* from which they harvested 20 *cestos* per *mita* (literally "turn," but used here as synonymous with "harvest").⁶⁰

Coca and other goods accumulated from the harvests on Inca lands were stored in provincial storehouses to support the army in wartime or to help the needy in time of peace. When famine struck, the storehouses provided relief for the entire population.⁶¹ In the Cuzco area some of these tribute goods were transported to the capital to support the Inca and the people who resided

there, but the portion that was not needed in Cuzco remained in the local depositories.⁶²

Only small amounts of tribute goods collected in the provinces were ever sent to Cuzco, and only a fraction of this was destined for the support of the royal court, which had family lands inherited within the various Inca lineages to support it. Instead, the produce from the provincial warehouses, which was much divided, served as a kind of capital upon which the state could draw to finance national and local public works projects. For example, support for the construction and maintenance of imperial and local roads was drawn from local labor. Provisions came from the provincial storehouses for these were the only sources of supplies available. The tax system had a distinctly local nature, although specialized local products such as coca were traded back and forth between valley and highland repositories.⁶³ In addition to local storehouses located near production zones, such as those at Quicheceti ($1\frac{1}{2}$ leagues from Chacapa) and at Tohone (near Cañaviri) where the people of Zongo deposited their coca, there were depositories at the Inca citadels in Charcas, such as Iscanwaya (La Paz), Inkallajta, Inkarakay, and Pocona (all located in Cochabamba).⁶⁴

It seems that the common people had fairly regular access to coca and other goods deposited in provincial storehouses. Falk Moore asserts:

The spending of the agricultural tax produce was governed fundamentally by the rule that if a man worked for someone, the "employer" was obliged to feed, clothe, and supply him with working materials during the period of his employment. This applied to tax-labor as well as non-tax-labor, such as craft work.⁶⁵

The *curacas* distributed coca and other goods among their personal retainers and to people who were assigned to work their lands, as well as to the poor and infirm. One of the principal chiefs of Chucuito, Martín

Cusi, declared in 1567 that he supplied the people who raised corn for him in the Moquegua valley of Peru with coca, sheep, wool and *charqui* (jerked meat).⁶⁶ In 1562, a curaca of Huanuco testified that the custom of the chiefs providing coca to their retainers and the poor was a "very old one."⁶⁷

Franklin Pease claims that this practice of redistributing among the population agrarian products of high social value such as maize and coca permitted the rapid development of a governing class that made the Tawantinsuyu possible. In its expansion, Cuzco used the criteria of reciprocity and redistribution that had long existed at the local level, but expanded them to an imperial scale. This state redistributive system required control of large labor forces for the production of agricultural goods and the construction of "specific objects." Andean custom dictated that these workers be maintained by drawing upon the state's provisions.⁶⁸

Despite the debate centering around the nature and extent of prehistoric commerce, it seems that trade was another means whereby common people obtained coca. Some historians argue that the problem of economic interdependence of different regions was solved primarily by the archipelago system of local, small-scale trade, rather than by wide-spread, large-scale commerce.⁶⁹ John Murra, the leading proponent of the archipelago concept, claims that the ancient "exchange" with the coastal valleys and the *montaña* (the tropical regions east of the Andes) provided highland people with valued products such as corn and coca, although he does not specifically label this exchange as commerce.⁷⁰ Nevertheless, the Huancas reported trading with neighboring groups in prehistoric times. The principal commerce was with Tarama and Chinchaycocha to obtain salt for which the Huancas offered corn, wool, *charqui*, and coca.⁷¹ Similar pre-hispanic trade also existed in the Huanuco area in the Chincha valley of Peru.

Finally, the earliest dictionaries of Andean languages included terms for commerce and merchant, for example, the Aymara term *quiru* signifying a coca merchant who traveled frequently to Yungas.⁷²

Interestingly, some who argue that the Inca prohibited coca use among the masses also maintain that coca leaf was one of the principal items of inter-regional trade both within the Inca Empire and with groups in northern South America, Chile, and Argentina.⁷³ This, of course, raises questions as to who was purchasing the coca and why. It hardly seems logical for people to trade for coca if they were not allowed to use it.

CONSUMPTION PATTERNS

Not surprisingly, the questions surrounding the consumption of coca in prehistoric times are more difficult to resolve than those concerning cultivation. A major reason, of course, is that the Spanish were more interested in the aspects of production than in those of consumption and naturally devoted more attention to them. Even so, important statistics such as quantity of coca produced in the early colonial period, not to mention the pre-Conquest period, are lacking, making it impossible to estimate the quantity consumed.

In early years of the Spanish occupation, coca consumption was widespread among the indigenous population throughout Peru, from Quito to La Plata.⁷⁴ In 1539, only seven years after Cajamarca, the Bishop of Cuzco informed the king that coca chewing was common among the Indians, who claimed that it sustained and refreshed them, and that the leaf was worth its weight in gold.⁷⁵

Some early writers insist that peasant consumption greatly increased with the disruption of Inca control, and that, seeing the great demand for this "forbidden fruit," the Spanish conquerors encouraged production and greatly expanded its cultivation.⁷⁶ Later proponents of the Inca monopoly theory also claimed that the use of coca as a stim-

ulant became a habit among the indigenous people of the highlands during the early years of the colonial period.⁷⁷ Without more exact knowledge of prehistoric consumption patterns, it is impossible to discern whether coca use actually increased—and if so, to what extent—in the post-Conquest period. Quite possibly coca consumption expanded, however, because all evidence points to a production increase approaching “boom” proportions. One estimate asserts that the amount of coca cultivated in Peru tripled between 1560 and 1567.⁷⁸ In 1571 Polo de Ondegardo claimed that there was 50 times more coca than when the Incas ruled Peru.⁷⁹

Even if notable growth in coca cultivation occurred in the early colonial period, it does not necessarily hold that prohibition's disappearance with the collapse of Inca authority caused it. Gagliano interprets the increased coca production as partly the result of the dislocations, including food shortages, caused by the Spanish invasion. The resulting privation and nutritional deficiencies led, in turn, to the extensive use of coca leaf among the natives, particularly those working in the mines.⁸⁰ Given the paucity of references to agriculture in the historical literature dealing with sixteenth century Peru, such an argument rests on little more than speculation, and to some degree, appears illogical. If it were true that famine and malnutrition led to higher levels of coca consumption, then expanding coca production in the Yungas might reflect a relative decline, or depression, in food-producing areas. Yet, as Herbert Klein has pointed out in his work on eighteenth-century Peru, the growing importance of coca as a cash crop indicates increased purchasing power among the natives, which hardly coincides with a general depression.⁸¹ Moreover, the historical literature is full of observations which challenge the theory that coca serves as a direct substitute for food.

A more plausible explanation for increased coca consumption lies in the Span-

ish emphasis on mining, which employed thousands of Indian laborers who consumed great quantities of coca leaf. Indeed, the expansion of coca cultivation coincided with the beginning of the colonial mining boom that followed on the heels of the 1545 discovery of the “Rich Hill of Potosi”—the largest single silver deposit ever discovered and the fulcrum of the colonial Peruvian economy. The exploitation of these riches required the mobilization of large segments of the native population in a forced labor system of tremendous proportions known as the *mita* of Potosi. Coca leaf became an essential active ingredient in this labor mobilization.⁸² The miners undoubtedly consumed great quantities of coca; even today they consume about twice as much of the leaf as does the average peasant worker.⁸³

Quite early in the colonial period, then, the Spanish became convinced that the natives would not work in the mines or perform any type of labor without coca leaf.⁸⁴ The concurrence of coca and mining booms strongly suggests a direct relationship between the two. The Chilean historian, Alvaro Jara, observes:

The growth in the extension of lands dedicated to coca cultivation and the expansion of its consumption, especially in the high altitude mining centers seems to reflect the almost vertical climb of silver production. Probably, if one constructed a curve of coca production . . . this would parallel that for silver, since it becomes a factor or production just as much as mercury for the amalgamation process.⁸⁵

The soaring demand among miners at Potosi, Porco, and other major mines throughout Peru would certainly account for part, if not all, of the increased production of the leaf. Likewise, if one follows the curves of silver production and coca use into the seventeenth century, the evidence for the direct relationship between the two appears even stronger. Most historical sources agree that the post-conquest surge in coca

use soon leveled off and began to decline by the early seventeenth century. According to Viceroy Juan de Mendoza, for example, coca was not used as much in 1615 as it had been previously.⁸⁶ Similarly, silver production at Potosi rose dramatically from about ten million pesos in 1550 to a peak of over thirty-five million pesos in the 1590s, when total Peruvian silver production peaked at about fifty million pesos. The Peruvian mining industry then fell into a depression in the seventeenth century in which total production slid to only slightly over thirty million pesos by 1650 and dropped to only twenty million pesos by 1700. The employment of Indian laborers recruited by the mita of Potosi also fell rapidly, so that there were only half as many *mitayos* working there by mid-century as there had been in 1600.⁸⁷ The seventeenth century decline in coca consumption also coincides with a marked downturn in the native demographic curve that would also help to explain the shrinking coca market.⁸⁸

Most scholars believe that the coca cultivated in Inca times was dedicated primarily to religious uses.⁸⁹ Yet, it appears that even then, the leaf played a major role not only in religion but also in work and social interaction. The use of coca in ritual and belief in its divine origin was widespread for centuries before the Incas. No satisfactory theory has yet explained why the coca leaf became associated with the divine. That it was, and still is, used in religious ceremonies sheds no light on the matter, for conceivably any leaf could have served this purpose.⁹⁰ The answer may lie in the plant's fatigue-combating, strength-giving properties. At least one of the prehistoric origin myths supports this notion. According to the legend, Mama Quilla (Mother Moon) who planted the sacred bush in warm climates on orders from Inti (the Sun God) so that its leaves would assuage man's hunger and fatigue and give him strength.⁹¹

In pre-Conquest times, when coca was

offered both to major deities and local spirits, most shrines had coca lands assigned to them.⁹² Cristobal de Molina (el Almagrista) in referring to pre-hispanic coca use in his *Destrucción del Perú* (1552) wrote, "every time the Indians eat coca they offer it to the Sun, and if they are near a fire they throw some in with great reverence as a means of adoration."⁹³

These practices continued into the colonial period. Father Luis de Morales, writing in 1541, noted that great quantities of coca, maize, llamas, and other things were sacrificed to the huacas and called for a concentrated effort to eradicate such idolatry so that the Indians could be Christianized.⁹⁴ The first Augustinian missionaries to reach Peru in the mid-sixteenth century reported that coca was burned in offerings to Atagujú (the Creator of all things) to insure life for the supplicants, their children, and their animals. The friars agreed with Father Morales that the prohibition of coca would curb these idolatrous practices.⁹⁵

Coca was so important to prehistoric Peruvians that it was associated with practically every major event in their lives.⁹⁶ Offerings of coca were made to the Pachamama (Earth-Mother) at plowing time and when constructing a new house, as well as to the Sun, the Moon, and local spirits to end drought.⁹⁷ Coca leaf also played a part in young Inca nobles' initiation as warriors. They were presented a *chuspa* (coca pouch) filled with leaves as a symbol of virility. Coca was used in burying the dead, whose mouths were filled with the leaves in the belief that if the dying man tasted coca his soul would enter paradise.⁹⁸ The use of coca in death rites was apparently accepted as much as 1,500 to 2,000 years ago. Posnansky found cadavers at Tiwanaku in which the viscera had been replaced with a mixture of coca and aromatic herbs.⁹⁹

One of coca's most important functions in Andean culture is its use as a stimulant for work and travel. We have already seen

that the Incas and local rulers provided coca for workers on public projects and for their personal retainers who tended their fields and herds according to the ancient Andean system of reciprocity and redistribution. Despite the lack of specific references in the documentation researched, it seems likely that this practice extended through all levels of society because even commoners needed help in planting and harvesting their family plots. We do know, however, that it was common practice in prehistoric times for travelers to leave chewed coca on the small cairns (*apachetas*), which are found along footpaths throughout the Andes, as an offering to the spirit who watches over the place and those who pass by it.¹⁰⁰ These customs, like so many others associated with coca, survived into the colonial period. Sixteenth-century travelers sought to renew their vigor through a coca offering to the Sun. A few leaves were tossed to the winds accompanied by the prayer: "Give me life and do not tire me."¹⁰¹

One final use of coca worth mentioning was as medicine to treat an infinite variety of ailments from headaches to wounds and broken bones. It was used as an anesthetic and enjoyed a reputation as an aphrodisiac. Spanish physicians borrowed coca from the native pharmacopoeia and it became a widely-used remedy among the elite. Nevertheless, many Spaniards remained skeptical of the natives' claims that coca dulled their hunger and gave them strength and energy. They regarded such claims as superstition supported only by "ancient customs."¹⁰²

CONCLUSION

Despite voluminous historical literature supporting the traditional interpretation that the Incas monopolized the production of coca leaf within the empire, evidence presented here, showing the existence of individually and communally-owned *cocales* in several regions, demonstrates that no em-

pire-wide monopoly ever existed. While the Incas may have controlled coca in the Cuzco area, they apparently did not do so in other regions of the Tawantisuyu such as the Bolivian Yungas, Huanuco, or Huancayo. Although the case for coca consumption among the masses is unfortunately not so clear, it seems that in many instances common people had ready access to the leaf for their own consumption. Indeed, the Incas promoted access to coca for many highland communities by encouraging the establishment of *mitmaquna* in Yungas areas for the cultivation of this important plant. It seems doubtful that people would have gone to so much trouble to produce great quantities of a commodity which the state forbade them to use. It is unlikely that Inca power ever exerted such absolute control over remote areas sufficient to enforce the prohibition of coca.

Why then did the myth of coca monopoly arise among the sixteenth-century chroniclers? The answer seems to be that they mistook idealized, legalistic formulas for actual practice. If we remember that the Incas were engaged in a plan to "break up old tribal loyalties and to integrate the whole population of the empire into a new national state,"¹⁰³ then their claims to ownership of all *cocales* while granting usufruct to favored subjects, as in the cases of Huancayo and Sacaca, becomes intelligible. In her analysis of this problem regarding property in Inca Peru, Falk Moore observed:

When a new province was conquered by the Inca, what did the victors exact as far as the land was concerned? Did the land-holding *system* change basically? There is good ground for the argument that what changed was merely the beneficial ownership of certain properties. Depending upon the source one favors, on conquest either all land was taken by the emperor, who in every village kept some exclusively for the Inca (government) and Sun (religion) and granted out to the community (collective agricultural unit) the use of the rest; or land interests remained as they

were, except that some parcels of land were assigned to the Inca and the Sun. There is no argument between these two versions as to the economic reality. They agree about who got what in terms of value. The difference is rather a legalistic one referring to title.¹⁰⁴

The coca monopoly resembles the idea that all livestock (i.e., llamas and alpacas) belonged to the Inca and that individuals could not own or use them without his permission. One source asserted that people made clothing from the wool of these animals and put it in the storehouses. The Inca then redistributed clothing to the people according to need.¹⁰⁵ This seems an unnecessarily cumbersome and complicated practice, but legal fictions like the state animal monopoly allowed the Inca to reward loyal supporters by permitting them to keep the animals they already possessed and to punish enemies by "reclaiming" them.¹⁰⁶

The same was true of coca. Just because the Inca claimed ownership of all cocalos in the empire and reserved the right to prohibit use of the leaf does not mean that peo-

ple lacked access to these lands or to the coca harvested from them. To assume this would be as absurd as assuming that people were forced to go about naked unless the Inca favored them with the redistribution of clothing from his storehouses.

In many ways, the coca monopoly theory contradicts all logic. Coca use constituted an important aspect of a pan-Andean culture much older than the Inca Empire, a culture which the Incas shared. It would have made little sense for them to prohibit its use among recently conquered peoples, a measure that would have increased animosity toward them as conquerors and further increased the likelihood of resistance to their rule. The current prohibitionist argument, which in part rests on the Inca monopoly theory, ignores the historical importance of coca in Andean culture, and those who support programs to spray the cocalos of Bolivia and Peru with deadly herbicides would do well to seek additional information before implementing a policy of such great potential harm to millions of human beings.

NOTES

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